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PRESIDENT'S ADDRESS

AMERICAN ASSOCIATION OF ORTHODONTISTS

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WITH the preceding exercises, this marks the opening of the Fortieth Anniversary Meeting of the American Association of Orthodontists, and the fourth to be held in New York City.

As a matter of historical record, it is interesting to note that in June, 1900, at the close of the first session of the School of Orthodontia, Dr. Edward H. Angle renewed some previous discussion on the subject of organizing an orthodontic society. It was agreed at that time to form a temporary organization with Dr. Angle at its head.

As the result of the plans set up at that time, the first meeting of what was decided to be known as the Society of Orthodontists was held in St. Louis on June 11, 1901, with Dr. Angle presiding as the first president, there being ten charter members.

Thus it was that from the organization of this small band of inspired and determined pioneers sprang what was later to be known as the American Society of Orthodontists, and what is now our American Association of Orthodontists, numbering 639 members, with seven constituent societies, and with forty years' history of sterling achievements which have marked the progress of the science of orthodontics as the largest and most outstanding specialty in dentistry.

A review of the progress of the Association year by year would be too lengthy to dwell upon at this time; however, it would reveal a spectacular march of progress through the efforts of an indomitable group of leaders and devoted workers, whose contributions have created a structure which constitutes the heritage we are now privileged to enjoy.

Read before the Fortieth Anniversary Meeting of the American Association of Orthodontists, May 6, 1941, New York City.

By their example we must realize the seriousness of our own responsibilities, and the duties which are incumbent upon us, in order to properly project present-day standards into what will soon become comparable history.

It is interesting to note that about the time of the twentieth anniversary of the American Society of Orthodontists—largely through its influence—the growth of the specialty had reached the point where there was an apparent need for the formation of sectional societies throughout the country. Hence the formation of the New York Society of Orthodontists, whose twentieth anniversary has recently been celebrated, and whose complete history for that period has been written and recorded in our official organ.

The New York Society of Orthodontists, in deference to the American Association of Orthodontists, has given up its annual spring meeting, and through the courtesy of its officers and members has placed its scientific resources and financial support at the disposal of the American Association of Orthodontists for the success of this meeting.

During my administration year as your President, so soon to conclude, many interesting events have transpired. It now becomes my duty to direct your attention to such recommendations as appear to be necessary for the protection and advancement of the Association.

In retrospect we must not lose sight of the men in this specialty, who during the entire life of this Association have given so much to the advancement of our science. This is addressed particularly to those members especially gifted in the conduct of research, in the art of writing, the ability of teaching, in technical skill, and in leadership. It is to men of vision that the present status of orthodontics owes its growth. With the ever-increasing burden being placed upon the present generation, this Association should encourage men of these types and place all its facilities and resources at their disposal for further achievement.

During the annual meeting of this Association held in Chicago in April, 1937, the late Dr. Frank A. Delabarre of Boston, Mass., because of his outstanding accomplishments and loyalty to the specialty was made President-Elect. At this time the city of Boston was unanimously selected for the site of the 1939 meeting, over which he was to preside. He had made extensive plans for his meeting, in which he hoped to accord pediatrics a prominent place.

His death in April, 1938, not only prevented him from achieving his ambition, but precluded his opportunity to actually serve as president, the honor to which he had been elected. It is my desire to recommend to the Association that Dr. Delabarre's name appear in the records as the posthumous president in the year 1939. I wish to further recommend that, should a similar circumstance arise in the future, the Association shall permanently provide for such an emergency.

Leading orthodontists have for many years advocated improving facilities in orthodontic education for any dentists who might be desirous of obtaining such training. The aim has been to lift the standards of orthodontic treatment, and at the same time to increase the volume of service available to the public. This has been evidenced by the persistent efforts of leading orthodontic teachers in interesting dental faculties in university schools in providing grad-

uate study under university auspices. By this means the number of properly trained orthodontists has been gradually increased and orthodontic service for the public has been greatly broadened.

Any criticism which may be directed toward the specialty of orthodontics contrary to these facts is unjust. Only by this means will the profession of dentistry be able to render the proper service to which the public is entitled. Any solicitation which the specialty has expressed in reference to the general practice of orthodontics has been only in the form of constructive criticism. It is true that every dentist has the moral right to practice orthodontics to the degree to which he is qualified, but in the same spirit, he should not exceed his own limitations.

In his address before the Association last year, President Murray stressed the importance of the changing economic problems which are continually arising in orthodontic practice. Events which have occurred since that time, and which are bound to transpire in the immediate future, would make his references even more important than they were at that time.

As has been previously stated, we are facing a situation where the specialist earns an income less than that enjoyed by a man of equal ability in general practice. Therefore, any effort spent toward studies in practice organization which will make it possible for the orthodontist to care for a larger number of patients, and, at the same time keep in effect suitable standards of practice should be one of the objectives of this Association.

I therefore feel it my duty to bring this subject to your attention again, and urgently invite your further consideration.

Recently a questionnaire was mailed to the members of this Association, with the request for their prompt cooperation in gathering the information sought.

During the past year, numerous professional questionnaires have been circulated throughout the United States. The American Medical Association and the American Dental Association, as well as a large number of their component societies, have sought information among their memberships. Of interest to us is the fact that special emphasis has been placed on information dealing with the availability and distribution of specialists in the health services.

During this trying period through which we are now passing, it has been universally demonstrated that all information which can prepare us for the uncertainties of the future may become invaluable. In the event of a national emergency, information procurable through this questionnaire would be of great assistance in the readjustment of orthodontic service for the public welfare.

Foremost among these requirements would be the protection of the public interest which orthodontics serves. In this particular, the Childrens' Bureau of the United States Department of Labor has already manifested its interest. It is a known fact that the orthodontist with some special training is capable of rendering indispensable service with surgical groups in the most efficient treatment of maxillofacial injuries. The fulfillment of this service to the highest degree is a patriotic duty which the science of orthodontics owes to wounded soldiers and would be expected to fulfill in any incidence of war. This service will naturally fall to our younger men who are best qualified for such duty. In-

formation should be available in order to select them with the greatest of care. It should likewise be the desire of those who will not be directly affected to protect the practices of these men during their absence.

These facts emphasize the value of orthodontics as a health service. They also emphasize the importance of orthodontics both in the Army and in communities subject to maxillofacial injuries. It is also realized that the older orthodontists owe certain responsibilities both to the public, their younger associates, and vice versa.

The Ad Interim Committee voted sufficient funds to gather this information. A special committee was appointed for this purpose and will present its report at one of the Executive Sessions. The returns have been most gratifying and our membership deserves the highest commendation for the realization of the importance of this issue, and for its loyal, prompt, and patriotic response.

During the past year a new agreement between the American Association of Orthodontists and the C. V. Mosby Publishing Company has been put into effect to govern the operation and editorial policies of the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY. The final consummation of this agreement has not been completed, but I am firm in my belief, from the numerous communications which have been brought to my attention, that with sufficient patience on the part of the membership it will be worked out to the satisfaction of all concerned. I think it is a matter which should take its own natural course, and should not be interfered with at the present time. The first Editorial Board under this new agreement is to be organized at this meeting.

It is my sincere hope that the condition will never be reached when organized agencies, operating among our membership, will interfere with the best interests of the American Association of Orthodontists. Men who do not think cooperatively or with a definite sense of construction should not be considered now. This is the time for *construction*—not destruction.

During my tenure as President of the New York Society of Orthodontists in 1936 a Committee on Public Information was formed. At the time of the first annual report of this Committee, its accomplishments and future possibilities underwent a thorough discussion. It was decided that the work begun should be continued on a national basis, and recommendations to this effect were presented to the American Association of Orthodontists. As a result the Bureau of Public Information was created by a unanimous vote.

It is not necessary for me to review the activities of the Bureau, as a detailed report will be presented at an Executive Session. The duties of this Bureau are for the preservation of professional integrity and the protection of the public interest, which is so vital at this time. My object in bringing before you this brief history is to recommend the continuance of this Bureau for the sake of its far-reaching benefits to our specialty and to the public we serve.

This is the twelfth anniversary of the American Board of Orthodontics. The current report of the Board reveals the fact that 146 members of the Association have been certified. Praise should be accorded to those Directors who during this time have been so thorough and exhaustive in the conduct of their investigations before issuing the certificate.

The fact that nearly one-fifth of our present membership has qualified under these high standards has no doubt far exceeded the hopes and expectations of those who participated in the creation of this plan. The example of those who have won this recognition should create a similar ambition among the members who have not as yet received their certificates.

And now as my term of office approaches its close, I am led to consider how burdensome the duties of the presidency might have proved had organization been less efficient. Thanks to the proper functioning of all committees, my task has been rendered easy and altogether pleasant.

To the members of the Program Committee I wish to pay special tribute. The manner in which they laid out their general plans gave early promise of what the caliber of the program would be. The manner in which each assumed his respective assignment was conclusive evidence of a determination to do everything possible to assure the success of this meeting.

To the members of the Local Arrangements Committee is also due a mark of special recognition for the detailed service they are rendering so capably during this meeting.

This opportunity must not pass without my complimenting the Ladies Entertainment Committee, together with the Ladies Auxiliary Committee. We feel they have spared no effort in providing for the pleasure and entertainment of the wives and families of the members from without the metropolitan area.

It would be very remiss on my part not to make some reference to that host of friends throughout the United States and Canada who in connection with this office have manifested their faith, loyalty and confidence, without which this would not be the great honor that it is. To them I wish to express the depths of my gratitude.

It is with a keen sense of appreciation that I also wish to acknowledge with thanks the unselfish efforts of all the personnel of the appointed committees in the preparation for and conduct of this meeting.

In closing I would like to read a quotation which to my minds is directly applicable to those men who, during the past forty years, have unselfishly devoted their time and energies in the building of the institution which the American Association of Orthodontists has become, or who have made contributions to the progress of the science and art of orthodontics, which have helped to give it the advanced position it occupies today.

> The real measure of a man, in my estimation, aside from his efforts to make a living or accumulate a competence from his chosen occupation, is the extent of his activities and his contributions to the betterment of mankind. Man has a plus value only as he does more than the average man.
>
> The progress which our country has made, the standards of living which our people enjoy, the opportunities which we have today are all the result of special services rendered and extra effort put forth by a few of our people who have gone beyond their obvious duty and have made important contributions to the common welfare.

Truly does this apply to the leaders who have elevated orthodontics to its present place among the beneficent specialties of the health services.

THE RESPONSIBILITY OF THE ORTHODONTIST IN THE TREATMENT OF TRAUMATIC INJURIES OF THE FACE AND JAWS

BRIGADIER GENERAL LEIGH C. FAIRBANK,* WASHINGTON, D. C.

WHEN hundreds of dentists are called to duty with the Army in connection with the present mobilization plans, every specialty of the profession is included. This call extends to the orthodontists, and therefore holds particular interest for the membership of this Association. It is obvious that the orthodontist is qualified for special assignment and should be given special consideration. It would be most unwise to assign an orthodontist to routine clinic duties, such as restorative dentistry, prosthetics, or oral surgery. It would be unfair to these specialists and to the patients. It is particularly fitting, however, to assign them to duty as chief clinicians, whose duties include examinations, consultations, assignment of patients, and general clinical supervision. Remember, such assignments are contemplated for the present mobilization and training program as provided for the next few years. It is an entirely different picture than that which will be presented in time of war.

The war-time duties of the orthodontist are related to the special field of maxillofacial orthopedics in connection with face and jaw surgery. In this special field, the orthodontist takes his training and rich experience and applies them to the various corrective problems which require meticulous care and exacting treatment to secure the satisfactory restoration of occlusion and function. Associated with the oral surgeons in the treatment of jaw casualties are the prosthodontists and the orthodontists. These specialists, working together and pooling their special knowledge and skill, are able to bring into the larger picture of maxillofacial restoration the splendid refinements of their specialties, which assure an amazing improvement in methods and results.

Previous presentations before orthodontic societies, including this Association, have given a fairly clear picture of the problems connected with gunshot wounds of the face and jaws and the particular responsibilities which will be of concern to the orthodontist during the reconstruction stage of treatment. Newer methods and more desirable concepts of these problems accentuate the importance of the orthodontist in this field. The correlation of our orthodontic training with the problems in this field draw the specialty into a very important position in the dental service in time of war.

We are all familiar with the outstanding work of Colonel Joseph D. Eby at Walter Reed General Hospital during the first World War. This marked the beginning of applied orthodontics in this special field. Appraisal of his achievements and the more modern developments of orthodontics bring evolutionary changes of great value when applied to these problems of jaw repair today.

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Presented originally before the Southwestern Society of Orthodontists, February, 1941, and revised for presentation before the Fortieth Anniversary Meeting of the American Association of Orthodontists, May 5 to 8, 1941, New York City.

This application of orthodontic principles in the field of maxillary orthopedics is but the application of orthodontic design and technique for extensive movement or control of the bony structures of the jaws. In the usual treatment of malocclusion, changes in the osseous structures result from applied orthodontic therapy; in the application of similar forces, deformities affecting large segments or an entire arch are corrected. In this particular field, we must think of our activity as maxillofacial orthopedics. We are not concerned alone with the jaw relations. Our efforts involve the movement of bone segments, often correction of jaw deformities, and frequently facial bones as well.

We must anticipate newer application of the familiar orthodontic forces in this broad field. We must develop a concept of our special orthopedic efforts comparable to the work of the general orthopedic surgeons, except that in the field of maxillofacial orthopedics the exacting requirements demand the meticulous efforts which have always characterized orthodontic skill. Even in the splint designs for all jaw fractures, orthodontic principles of anchorage, fixation, intermaxillary force, and stabilization and control are basic requirements. We have of necessity applied these principles in somewhat different form to correct the deformities which result from war injuries. To present this extension of orthodontics into this special field, it is desirable to bring several important details of technique to you and then to present individual cases giving the clinical aspects of applied therapy.

ANCHORAGE

The orthodontist is inclined to think of anchorage in terms of orthodontic bands. It is obvious that only in special cases can we use bands for anchorage in the correction of jaw injuries resulting from battle wounds. When measures are first undertaken to reduce fractures or to secure fixation and immobilization of the remaining fragments, it is highly impractical and almost impossible to use fracture bands on the freely movable fragments. Anchorage must be secured over a broad area; it must include several teeth. In other words, the demands for anchorage require compound fixation to immobilize jaw segments and to distribute this anchorage for the control or movement desired for the restoration of arch form and original occlusion. Splints and splint appliances usually may be described as possessing compound reciprocal anchorage. As a matter of fact, in all fixation, whether for any variety of maxillary fracture or for gunshot casualties with loss of bony substance, the ideal anchorage is compound reciprocal in character for satisfactory immobilization. This may be secured by a splint appliance with broad anchorage involving many teeth; it may be secured by the application of the Stout multiple loop wiring.

It has been determined that our more modern types of anchorage do not require cementation if the attachments can be secured on a considerable number of teeth and the contours of the teeth themselves provide the proper surfaces for firm fixation. In other words, a sufficient number of teeth, well shaped and of desirable size and contour, afford satisfactory attachment for anchorage without cementation. The new type of splint is made of cast silver or acrylic denture base material. Attachment is secured on all teeth in each segment. We favor the fixation without cementation, for removal of the splint segments is

possible without danger of irritation or disturbance to the newly repaired bone. One very effective type of appliance provides extraoral anchorage. This is the interesting "coat hanger" appliance. Making use of two wire coat hangers, a simple head bandage and gauze, this appliance is most helpful in the reduction of depressed fractures of the maxilla. This type of fracture is frequently observed in airplane, automobile, and industrial accidents as well as in battle casualties.

INTERMAXILLARY FIXATION

Orthodontics has made use of intermaxillary traction for many years. Though mild in force, it has stimulated many factors for bony change and arch relations. In fracture work, intermaxillary force should be much stronger to overcome uncontrolled muscle pull and to direct individual bone segments into proper position. The use of elastic traction rubbers has proved its greater value over other forms of intermaxillary fixation. In all jaw work, it is decidedly contraindicated to apply the older forms of intermaxillary immobilization such as pin and tube and wiring. A recent case requiring bone graft was successfully treated at Walter Reed General Hospital by means of intermaxillary fixation which was secured by using the continuous loop wires on each arch and heavy elastic traction for immobilization.

INTRAMAXILLARY TRACTION

Mono-maxillary force for the reduction of fractures, and for the application of force to overcome displacement, has long been recognized. In the first World War, this was accomplished by the use of the jackscrew in the bulky splints then in use. Such splint appliances are made in sections. By the use of large square tubes and pins and the application of elastic traction, displaced segments may be adjusted to their proper positions, even though union has taken place.

CONTROL OF EDENTULOUS FRAGMENTS

Gunning was the first dental surgeon to devise a method for the control of edentulous fragments. Various methods were used in the hospitals during the first World War to reduce fractures of this type or to control the edentulous fragments in cases of gunshot casualties. The present-day refinements not only provide splendid control and easy reduction, but also permit partial function of the mandible. This of itself stimulates bone repair and is thus of great advantage.

The orthodontist provides needed assistance in the early hospital care of jaw casualties. More particularly, this specialty offers greatly needed assistances for the old cases with bony union in malposition. In cases of loss of bone and collapse of segments with bony union, the principles of orthodontics were used as far back as the Crimean War. In this work, great varieties of splints and appliances may be designed to re-establish original arch form and occlusion. In some of these cases, heavy appliances designed more like the usual orthodontic appliances may be indicated. Where bony union has occurred, orthodontic bands may be used for anchorage. Heavy arch wires and stronger elastic traction are indicated when sufficient anchorage is obtained.

Recent discussions with oral and plastic surgeons disclosed that occasionally these surgeons resort to extensive surgery to re-establish original arch form and occlusion. This is a needless procedure, and many of these cases can be corrected much more easily with "bloodless orthopedic" methods. We must remember that many of these cases—gunshot wounds with loss of osseous structure, as well as those of nonunion—frequently require extensive surgery. It therefore appears sound to weigh carefully the problems presented, and in our treatment planning provide the most logical and effective restorative measures with a minimum of surgery and the application of orthopedic measures whenever possible.

The orthodontist must think of the splints and various methods of wiring or fixation in terms of orthodontic principles. New and unusual measures of fixation, stronger traction, and more effective spring force are to be found in the appliances designed for the correction of displaced bone fragments. Remember, the use of broad anchorage prevents the movement of the individual teeth, but does re-establish the jaw segments in their original relation. The many auxiliary attachments common to every orthodontic appliance may afford possible suggestions in the modern splint appliance for orthopedic measures in the maxillofacial adjustments necessary for jaw casualties.

We are all familiar with the tissue changes which occur under orthodontic treatment. In the treatment of old jaw cases, presenting union of the segments or fragments in malposition, the application of strong and effective forces by means of properly designed splint appliances stimulates similar bony change at the line of fracture. In other words, cell activity, induced through the medium of the splint appliance, will bring about the necessary readaptation of the segments and correct the malposition. By gradual reduction we re-establish arch form and restore original occlusion and normal function of parts. The applied orthodontic therapy stimulates activity of the osteoblasts and osteoclasts in the bony change and adjustment of fragments into their original functional relation.

The process of bone repair is very complex, and there are some interesting aspects to bony change under the influence of orthopedic manipulation. It has been established by physiologists that bone and cartilage are derivatives by adaptation from connective tissues. Under certain influences bone will revert to connective tissue or cartilage will be transformed directly into bone. In fact, tissue of the connective tissue group undergoes frequent transformations. We must recall the connective tissue origin of bone, and that its characteristics dominate all the problems of its growth, regeneration, and repair. Perhaps there is no part of the bony structure of the body which so clearly demonstrates functional adaptation in reparative processes. The application of orthodontic therapy, so thoroughly understood by our special group, widens the scope of our work when applied in the required manner for the correction of jaw deformities, resulting from gunshot wounds and other injuries.

Where and in what manner will the orthodontist fit into our Army hospitals is your great interest today. We visualize the orthodontist as one of that trio of specialists making up the important group engaged in the reconstructive work for jaw casualties. Their skillful energies will be available in the large

general hospitals to which the face and jaw cases are sent. Every facility will be available. Oral and plastic surgeons, dental oral surgeons, prosthodontists, and orthodontists—all with special training for this special work—will be collaborating to the end that the most desirable results may be obtained. It is anticipated that jaw casualties will be grouped in wards used exclusively for them. Special surgeries will be provided for their surgical care. The necessary laboratory facilities will be maintained for the fabrication of all the various splints, appliances, and final dental replacements required for the patients. Adequate personnel will be provided for each special requirement for the specialist groups making up this highly developed service.

The presentation of the special service required of the orthodontist in the Army in time of war is far different from that which we experience in the more desirable periods of peace. The possibilities for effective service make it a very desirable service. The opportunity to bring a more satisfactory end result in the efforts to restore the facial structures and dental function is a feature which will bring many men of our specialty into a splendid activity which affords lasting benefits to those who must bear the scars of battle in our future wars.

In our great mobilization at this time, when we are engaged in such stupendous efforts for national defense, we should reflect upon some very convincing truths. It is well to remember that all our efforts in the fields of a great medical service are directed toward one objective—the development of a great healing force. War is a destructive power! Today, in this world where war reigns, the only healing and comforting force is medicine! Medicine shares its opportunity for service, in these trying and distracting days, with the recognized health professions. Uniting in our training efforts, sharing our responsibilities, and pooling all our special skills and knowledge, we are working to develop a great Medical Department to maintain health standards in camps, to prepare for the greater tasks which may be required to heal the wounds of war, and to maintain our American democracy and its institutions.

DISCUSSION

Dr. Robert H. Ivy, Philadelphia.—General Fairbank has presented to you in his unexcelled way the entire problem of coordination of all our resources in the restoration of function and appearance of faces and jaws injured in war. He has shown you many of the methods and appliances, based on orthodontic principles, which are being used in the reduction and fixation of bony displacements. I wish to supplement his talk by showing you through lantern slides a few cases in which the bone injury was complicated by wound of the soft tissues and where there was an association of dental orthopedic treatment with plastic surgery in achieving the final restoration.

Where we have a considerable loss of bone in the mandible, complicated by extensive destruction of the overlying soft tissues, it is a fundamental principle that the remaining bone fragments first be brought out and fixed in as normal relationship with the upper jaw as possible, regardless of the width of the gap thus created. After this has been done, then the problem of closure of the overlying soft tissues is in order. If the reverse is carried out, i.e., closure of a large soft tissue loss over collapsed bone fragments, the result will be a narrow mandibular arch with loss of function and greatly impaired appearance, requiring several difficult and complicated operative procedures in an effort to overcome the deformity. Where large defects in the mandible exist they can be satisfactorily filled with bone grafts, preferably from the crest of the ilium, restoring the continuity of the bone and

permitting function of the jaw. Where there is a combination of both loss of bone and overlying soft tissues, after reduction of the remaining bone fragments, it is necessary next to close the soft tissue gap and provide a bed for the bone graft before attempting to insert the latter. [Several slides were shown, illustrating cases of this character.] There are some skeptics who doubt the durability of bone grafts in the mandible. I will close by showing slides of a case of bone grafting in the mandible, in a subject now a member of this Society. A compound comminuted fracture of the mandible with loss of substance due to gunshot wound in France in 1918 required a bone graft from the crest of the ilium which was applied at the Walter Reed Hospital early in 1919. The last slide, made from a roentgenogram taken a few days ago, shows perfect consolidation twenty-two years later.

Finally, I wish to pay a personal tribute to Leigh Fairbank, who has been selected by the Surgeon General to administer the problems connected with facilities for the care of war injuries of the face and jaws. No happier choice could have been made, since he enjoys the confidence of members of both of the allied professions who are concerned in this field.

Dr. Douglas C. Parker, New York.—I am very happy indeed to discuss the paper of Brig. Gen. Fairbank. Dentistry has been honored by having as its representative in the Surgeon General's office in times of national emergency, a man with the zeal and enthusiasm for his chosen profession as displayed by Gen. Fairbank. I, like many others, have been inspired by his ideals and patriotic motives. This, coupled with his tireless energy exhibited in the conduct of his high office, sets him up as an example to other Army officers.

The specialty of orthodontics has been fortunate to have one trained in this field occupying such high office.

Gen. Fairbank sent me his paper a week ago, and I have been able to consider it very carefully. The whole subject of our relationship to the Army has been a subject of intense interest to me, and I have given a great deal of thought to the possibility of training men to fit into the scheme of things, should war develop.

The specialty of orthodontics is the most highly organized specialty in dentistry, and those who confine their professional activities to this field become skilled in facial orthopedics as well as the technical details of using mechanical means to augment the physiology of growth and development of the teeth and jaws.

Gen. Fairbank has pointed out the various forces employed and anchorages used by the orthodontist. I feel that all men affiliated with the field of maxillofacial surgery should be familiar with orthodontic principles. We have one of two things to do in this connection: we either have to teach the oral surgeon more orthodontics or teach the orthodontist more oral surgery. Numerically there are many more orthodontists than could possibly be used in the Army in time of war if they confined their work to orthodontics. It is readily seen that if many orthodontists were drafted, a large percentage would have to adapt themselves to general dentistry and oral surgery, if they were to be commissioned in the Army. There is one basic principle that an orthodontist would have to adapt himself to in the early treatment of traumatic injuries about the face and jaws, and that is the type of appliance used. In maxillofacial surgery parts have to be replaced in normal apposition at once, if possible, rather than moved slowly as the orthodontist has accustomed himself to do. All appliances have to be stronger and more rigid than those he has been in the habit of using. Where arches are used in maxillofacial work, more teeth have to be used as anchorages than in orthodontics.

Another basic condition that the orthodontist is seldom familiar with is the rigid asepsis that is necessary in surgery. Wounds of the soft tissues are foreign to most orthodontists, as their work in the main deals with the physiologic development of the face and his handling of teeth seldom involves soft tissue.

I agree with Gen. Fairbank that the orthodontist can play a very important role in the military picture, but it would be mainly the role of teamwork in the large reconstruction centers where his concept of appliance design would be of great value. The surgeon has a pretty good idea of what he wants to accomplish but seldom has the training in handling appliances to reach that goal.

Orthodontics has had a great boost in military surgery, due to the splendid work done by Dr. Joseph D. Eby in his teamwork with Dr. Robert H. Ivy. I am quite familiar with

their work and feel that few orthodontists could have fulfilled the role played by Dr. Eby. I will let you in on a little secret; Joe Eby had a pretty good background of surgery before he went into the Army, and with the additional training he had in special schools in the Army, he was fitted to do the fine work that so distinguished him at Walter Reed Hospital.

My one suggestion is that if the Army is going to use orthodontists in the war, give them a more thorough groundwork in surgery.

Dr. Joseph D. Eby, New York.—It has been a great pleasure to read General Fairbank's paper and to contemplate its presentation at this time. It is an honor to participate in this discussion with Doctors Ivy and Parker, men whose skill is of the highest, and whose friendship reposes deep within my heart.

A study of large numbers of extensive traumatic injuries within the maxillofacial area, resulting principally from missile wounds, will, after they have reached the reconstruction stage, reveal many interesting observations. Through a clinical and radiographic study of these injuries, after the infection has been cleared up and several months have elapsed since the injury, one can sense and almost "read" from the conditions found what sort of treatment was previously received.

The stages through which these cases have to pass are first aid, emergency, septic, definitive, and reconstructive. I am sure our Essayist and Doctors Ivy and Parker will agree that proper immobilization from the very beginning through all of these stages is the "key" by which most of the surgical phases may be controlled.

Immobilization reduces the risks of hemorrhage and shock-producing tendencies; infection is reduced or better controlled; invaluable hard and soft tissues are conserved and placed at or near their former positions. Dr. Parker's development of elastic support in bandages is a great boon to those who suffer facial wounds. It is a notable fact that similar facial wounds may vary extremely in their final reconstruction requirements. One case may receive a maximum improvement within a few months after healing has occurred while a similar case may require a year or longer for the operations which are necessary.

All of these cases reflect the importance of properly administered treatment during the early and intermediate stages. It would be very unjust to implicate blame for carelessness on anyone, since it must be remembered that the exigencies of combat produce overwhelming conditions in varying degrees of intensity. Such factors as multiple wounds, shock, broken lines of evacuation, the inability to bring equipment up to the patient or to get the patient back to proper equipment, the need to administer the greatest good to the greatest number all enter vitally into the wide panoply in which every wound is a part. Nevertheless, it is known that the preventive value of early and intermediate treatment of face and jaw wounds determines far in advance the nature and degree of what is to follow.

Dental officers with combat troops should be trained in auxiliary surgery, especially first aid, dressing and bandaging of head-wounds, and postural positions during evacuation. Jaw cases may require emergency treatment at advanced surgical stations in their progress to the rear, but no holding together of parts other than bandages.

During the last World War most if not all of the maxillofacial wounds received their septic and definitive treatment in Base Hospitals located at reasonable points of safety within the intermediate zone, but not too far behind the lines. These Base Hospitals were staffed by personnel from our leading universities and hospitals, but there was no special selection or training of dental officers for this work. These University Hospitals are now known as General Hospitals, of a thousand-bed capacity. These hospitals require seven dental officers, and it is at this point that orthodontic training should first enter the picture. From this point back to the reconstruction centers in the zone of the Interior, jaw cases should never be without this special service.

In this work the basic principles of orthodontics have to be converted into orthopedic principles as they affect the teeth and jaw bones. This does not mean that every orthodontist is already qualified, nor does it mean that Dental Officers experienced in oral surgery or general dentistry could not be trained for this special work. The implied thought is that the orthodontist's groundwork would give him a deeper insight into the more complex phases of anchorage and design, upon which the degree of ultimate success is so dependent.

The orthodontist should have special training in this and other subjects. He should know as much as possible about traumatic and plastic surgery, as well as all of the local and general symptoms which are associated with these wounds. In addition to the duties outlined by General Fairbank, he should be able to assist the oral surgeons during operations, should be able to manage the changing of dressings and the many preoperative and postoperative procedures which constantly arise.

From my experience and observation, I believe that the successful designing and construction of splints should be divided into two phases—first, security of anchorage, and second, simplicity of design. It is intensely gratifying to note the improvements which have been made in intermaxillary wiring and splint design since 1920. They constitute mechanical improvements over the same principles, and do not imply that the methods which stood the test twenty years ago are not still effective today. Special praise is due to Lt. Col. Roy A. Stout for his genius and his splendid contributions.

In addition to his leadership, it is particularly fortunate that for the past twenty years General Fairbank's first love in his work has been orthodontics. No one understands better, or is more capable of making the proper distribution of this special service in the Army.

Addressing myself now to Colonel Ivy, may I extend to him my salutations. The nearly two years spent at Walter Reed Hospital—in 1919 and 1920—working with and under him were the two happiest and most useful years of my entire career.

May a merciful God forbid, but should the wrath of War descend upon us, may we accept our training and place our services above ourselves to establish a record of which the science of orthodontics may be justly proud.

Brigadier-General Leigh C. Fairbank, Washington, D. C. (closing).—Mr. President and the kind discussers: I very deeply appreciate the privilege of appearing before the Association, and the kindness with which my paper was received by the eminent men who discussed it.

There are some aspects to this problem which reach down into one's soul. You know, few people appreciate what is going on in Washington today. Our love for our nation, our devotion to our profession, and our great zeal for peace leave one in a state of despair at times. Some day you will know the whole story; some day you will participate in the load.

The surgeon works under the most adverse circumstances in war. Tragedy is present. Clothing can cover many of the scars and wounds; an empty sleeve can be filled with an artificial arm; a stump of a leg can be restored so that a man may walk; but oh, the tragedy of a man who must return home with a scarred face, a man who cannot take his place in society.

Our problem is a very serious one, and, as I look to the days ahead, I know we must plan to meet the problems effectively. I have a great hope that we may unite with the distinguished oral and plastic surgeons, so that we may put our shoulder to this tremendous problem and be perpared to meet the unusual demands that may confront us in the very near future.

Dr. Parker brought to our attention the fact that a man must have some inclination for surgery. All orthodontists will not fit into this picture. In the training program that is being developed in our office today there is a very intense schedule drawn up which involves chiefly the oral and plastic surgeons, the prosthetists, and the orthodontists. The roentgenologists also come into the picture because very few of them know how to take proper pictures of jaw cases. But if, in our combined efforts, in the intense training which we give, we can bring back those whose faces are torn and scarred, so that they may be useful and happy people in our communities, that can be the most wonderful service which can be rendered by any professional group in this country.

It has been my great privilege, with Colonel Stout, to visit many surgical groups. During the last one and one-half years we have labored with the distinguished group Colonel Ivy represents. We have just completed a very important text on the standard procedures in faciomaxillary surgery. It includes the necessary chapter on dental orthopedics; it includes the restorative work. It will be the standard which we will use in our training program.

There has been published recently by the American Dental Association, under the auspices of the Preparedness Committee, a little text which covers many of the important early phases of treatment. This can be secured from the American Dental Association headquarters. It is seventy-five cents a copy, I think. It would be very illuminating to all of you to study it, because it presents some of the aspects with which but few of us have in any

way become familiar. It gives a fair picture of this enormous problem and some of the methods of treatment.

I want to thank the men who discussed the paper, and I also want to thank the membership for their undivided attention.

In closing I want to give you one little picture.

In the closing days of the last war, in the intensive work that went on at Walter Reed Hospital in Washington, Colonel Ivy and Colonel Eby worked side by side for many months. They did beautiful work, mending the torn and battle-scarred faces of our soldiers.

Among the many patients for whom they worked was a little sergeant who had been wounded many times and was torn up terribly. You saw a slide which Colonel Ivy showed of bone repair in that man's jaw. He had several operations. It was an endless task to repair that mutilated face.

Colonel Eby went into the ward one day to give instructions for preparation for another operation on the patient. He went over to the lad, patted him on the back and said, "Well, one of these days we will be all through with this sort of thing and your face will be well; we will have you fixed up." Hospitalization had been a long and trying ordeal in this particular case.

With the faith that a surgeon likes to see expressed in his patient, that torn, scarred face looked up and smiled, and he said, "Doctor, I just hope the day will come when I can do something equally as good for those who are injured."

The years have passed and that former little scarred, shot-up sergeant, so desirous of a career, attended the University of Pennsylvania Dental School, and Columbia University. Today he is on the faculty at Columbia; he is associated with Colonel Eby in one of the finest practices in New York City. He it is who was brought back to his place in society through the healing force administered by our distinguished confreres who discussed my paper.

Is there not an inspiration in the hearts of all of us for real and genuine service today? There is a demand for our profession to prepare in this tragic period. With the inspiration which comes from the past accomplishments of our distinguished men, may we carry on with the determination which will make our service effective when we are called for active duty in our military forces.

ORTHODONTICS IN THE TREATMENT OF CLEFT PALATE

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THE need for sympathetic and competent surgical and orthodontic treatment for sufferers from cleft palate is accentuated by the unjustified stigma from which they suffer. From an orthodontic viewpoint the problem is concerned primarily with postoperative care. Usually the orthodontist or dentist sees the congenital cleft palate patient only after surgery has been performed, and frequently not until many years have elapsed. His attention, therefore, is focused upon those cases in which there are postoperative perforations in the palate, or on unsuccessful or mutilated cases. These openings and deformities may resemble the sequelae from acquired conditions, or the sequelae from acquired conditions may resemble congenital anomalies. As a consequence these similarities in the appearance of the structures give rise to implications, superstitions, and needless speculation regarding the unfortunate with congenital cleft lip and cleft palate.

To help us better to comprehend the complex nature and extent of these distressing deformities, it is of advantage to consider not only the congenital anomalies and acquired disfigurements and perforations, but to review as an integral part of the cleft palate problem those collateral subjects which may shed light and improve our perspective of the cleft palate problem in most of its aspects.

Accordingly, we shall present first, a résumé of acquired perforations and clefts in the hard and soft palates resembling congenital cleft palate and postoperative sequelae; second, a developmental study of the embryo and early fetus; third, an evaluation of the attributed etiology of congenital cleft palate; fourth, the orthodontic treatment phase of postoperative cleft palate; and finally, a brief discussion of cleft palate speech.

ACQUIRED PERFORATIONS AND CLEFTS

As a sequel to trauma, syphilis, tuberculosis or neoplasms, part of the tissues forming the hard and soft palates may be destroyed and an opening effected between the nasal and oral cavities. The facial tissues also may become involved.

Before injury or onset of illness there is no communication between the oral and nasal cavities except indirectly through the posterior nares and the nasopharynx. The hard and soft palates are normal in structure and normal in function. The openings or changes in the hard and soft palates or face are acquired later in life and therefore must not be confused with the congenital condition.

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This paper was accepted by The American Board of Orthodontics as partial requirement for a certificate of qualification.

TRAUMATIC PERFORATIONS

With the hazards of modern life among which are automobile, airplane, and factory accidents, etc., injuries involving the face, lip or palate may be sustained directly. On the dentosurgical aspect, accidental exposure of the antrum may follow the removal of embedded maxillary roots or impacted teeth or dental cysts resulting in an opening into the nasal fossa. This type of perforation is usually closed immediately or as soon thereafter as the surgical condition makes feasible. Such occurrences are familiar to us all.

PATHOLOGIC PERFORATIONS AND CLEFTS

A. Syphilis.—Syphilis is an insidious disease which may be congenital or acquired. If its ravages are not controlled through treatment, its destructive processes will continue until it reaches the gummatous stage. In some cases the destruction may attack the maxillary and facial bones producing lesions which will result in the wasting away of parts of the face, palatal bones, or mandible. The mutilated palate may present a perforation communicating with nasal fossa and, if both the hard and soft palates had been destroyed, may show a condition resembling a congenital cleft of the hard and soft palates. The following cases are cited to illustrate.

Case 1, a colored girl, 15 years of age, presented a typical picture of congenital syphilis. She had a saddle nose, ulcers of the cornea of the eyes (keratosis), impaired hearing, and glossitis of the tongue. There were ulceration and sequestration at three centers in the palate with perforations into the inferior nasal fossa (Fig. 1*A*). The ulcerative process spread and the small openings in the palate probably coalesced into one large perforation. Her speech had a distinctly nasal twang. The patient was referred for a course of anti-luetic treatment.

Case 2, a married woman, 55 years old, gave a history of a critical illness of luetic origin shortly following the extraction of teeth (Fig. 1*B*). During the course of the illness there was a severe inflammatory process involving her nasal bones, vomer, palatal process of the maxillary bones and horizontal processes of the palatal bones, soft palate and left ramus (Fig. 1*C* and *D*). The illness ran the usual course of periostitis, osteitis, osteomyelitis, and sequestrum formation. The sequestra were removed. She survived, but part of the nasal septum and somewhat more than one-half of her hard and soft palates were destroyed. The resultant opening in her mouth leading into the nasal cavity resembled a congenital cleft palate (Fig. 1*E*) except that the soft palate was sclerosed and was adherent to the posterior pharyngeal wall completely obliterating the anterior and posterior pillars of the fauces. A pathologic fracture of the mandible had taken place and clinically had united with fibrous union. The body of the mandible was shortened, the left premolar region becoming continuous with the anterior border of the ascending ramus. The poor patient was simply a human wreck.

Plastic operations performed by Dr. Y. Huber* restored her lost nose and a plastic graft filled in the defect on the left side of her mandible. An obturator

*From Dr. Burdick's Surgical Service, Hospital for Ruptured and Crippled, New York City.

was constructed to close her palate and to restore her maxillary teeth. A surgical prosthesis was constructed for the mutilated mandible, supplying the missing mandibular teeth (Fig. 1*F*). This individual is now a fairly reconstructed happy individual.

B. Tuberculosis of the Mouth.—Tuberculosis attacks not only the lungs, but many other tissues as well. Tuberculosis of the maxillary bone is rare and is usually secondary to the disease in other parts of the body. The course of illness resembles similar processes in other mouth conditions and may be overlooked as tubercular. The case shown here is one in which a biopsy revealed the tubercle bacilli.

Fig. 1.—*A*, Moulage showing syphilitic perforations, keratosis of eyes, saddle nose. *B*, Photograph of patient showing normal features many years before disastrous effects of syphilis. *C*, Occlusal x-ray view showing destruction of palate, vomer, etc. *D*, Radiograph of left ramus showing ununited fracture following syphilitic osteomyelitis. *E*, Moulage showing the ravages of syphilis on the nasal, maxillary and palatal bones. Resulting cleft palate simulates a congenital cleft in appearance. *F*, Photograph of same patient with obturator in position. Plastic restoration of nose by Dr. Y. Huber.

Case 3 was a young woman of 19. She had what was described as an abscess in her maxillary incisor area. The removal of all her six maxillary anterior teeth followed. However, the granulated area persisted (Fig. 1*G*). A section was taken and sent to the pathologic laboratory for examination. The laboratory report read "Tuberculosis of the gum of the maxilla." The patient was referred for stimulating doses of radium. It is believed that sequestration left a perforation of the alveolar process or the perforation into the nasal fossa may have followed the application of radium.

C. Neoplasms of the Palate.—Destruction of the palate may follow the growth of a neoplasm. As a consequence of the loss of tissue there will be an opening leading from the mouth into the nasal fossa which may resemble a cleft palate. Such a case follows:

CASE 4, a man,* age 47, had a large perforation in the roof of the mouth and a partial cleft of the soft palate connecting the oral cavity with the nasal cavity.

His history revealed an early traumatic lip injury which dated back to the age of six and the surgical removal of a hard obstructing growth from his nostrils seven years later.

Beginning at the age of 18, either roentgen-ray treatments or radium radiation was administered at different times for the alleviation of pain. Varying periods of relief followed. Shortly after the initial therapeutic application of roentgen ray, his maxillary six anterior teeth were lost. This was followed five years later by the appearance of a small perforation in the anterior region of his hard palate and the apparent onset of the collapse of his external nose.

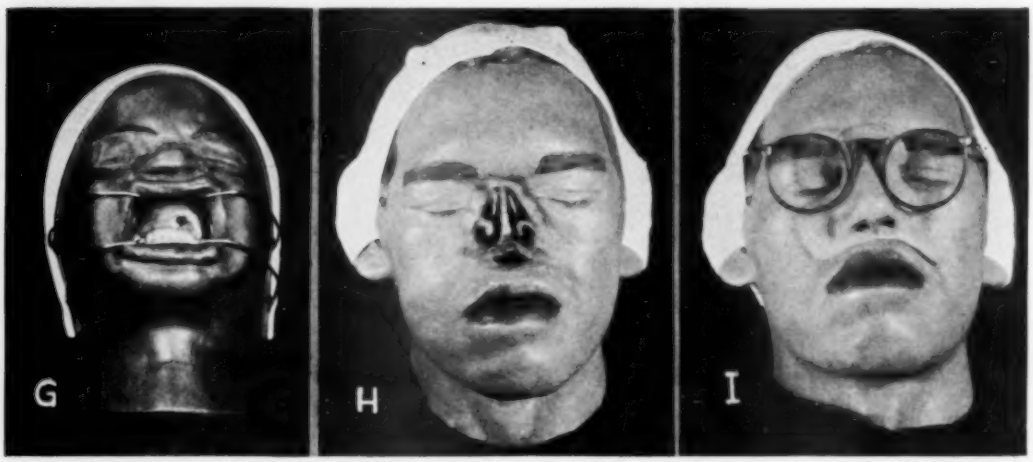

Fig. 1.—*G*, Moulage showing tubercular lesion of mouth. *H*, Moulage showing perforation of palate as viewed from above, resulting from growth of neoplasm. *I*, Same moulage as Fig. 1*H*, showing nasal prosthetic in position.

When the patient at 43 presented an open sore on the side of his nose, surgery was considered necessary. At that time the external nose was removed. The diagnosis reported was basal-cell carcinoma, although the original diagnosis was rhinoscleroma.

Upon admission to the Montefiore Hospital for Chronic Diseases, a dental examination of the patient, now 47, showed an edentulous maxilla with a large perforation in the anterior region of his hard palate and a partial destruction of the uvula and adjacent soft palate. The external nose was destroyed (Fig. 1*H*).

Drs. Tanchester and Rothschild constructed an obturator to which was attached a vulcanite external nose. The artificial nose was maintained in position with the aid of spectacles (Fig. 1*I*).

*Case presented through the courtesy of Dr. D. Tanchester, Chief of Dental Department, Montefiore Hospital for Chronic Diseases, N. Y.

The obturator sealed the opening between the oral cavity and the nasal cavity and replaced the missing part of the soft palate. Thus the patient was able to articulate and also to masticate his food. The nasal prosthesis aided in retaining the obturator. It also improved his appearance and thereby rendered his remaining days more endurable.

EMBRYOLOGIC CONSIDERATIONS

All the perforations and deformities simulating congenital cleft palate or postoperative sequelae described above appeared in patients in late adolescence, maturity, or middle age, while congenital cleft palate is present, of course, at birth. In the latter type it is obvious that union of the parts about the mouth had failed to occur during intrauterine development. Careful study of human embryology, therefore, will contribute to an understanding of possible etiologic factors.

In the process of maturation in the production of the spermatozoa and ovum from their respective generative cells, each is equipped with but one-half the original number of chromosomes. At the time of fertilization only one spermatozoon penetrates the ovum. The head of the spermatozoon, composed chiefly of nuclear elements, is the only part to pass into the cytoplasm of the ovum. It then combines with the nuclear elements of the ovum. Thus the mixture of their chromatic substances makes up the full quota of forty-eight chromosomes present in the human species.

The chromosomes are supposed to contain genes which are concerned with heredity. The chromosomes supplied by the ovum and the spermatozoon are believed to possess the characteristics of their respective progenitors. Together the fertilized egg cell possesses all the possible inheritable familial traits of the female and male ancestors.

Following fertilization, the ovum increases both in size and in the number of cells forming its mass. The resulting ball of cells is called the morula, which continues to grow and eventually to form the blastocyst. At this stage it is believed that the ball of cells lodges itself within the folds of the uterine wall. There it arranges itself into two sets of cells forming the trophoblasts. From the superficial cellular layer of the trophoblast finger-like processes, the syncytial processes, extend. These processes through their phagocytic power absorb the uterine wall, attach themselves to the uterus and burrow through the uterine blood vessels creating spaces. These spaces fill up with maternal blood which will supply nourishment to the embryo. It should be noted that as the cells proliferate the increased activity causes invagination or evagination on its less active adjacent layer bringing about tubular or hollowed formation.

While cells multiply and the layers of the trophoblast differentiate, the cavity of the archenteron and coelom form and the amniotic cavity appears (Fig. 2*A*). At the embryonic pole the amniotic cavity is separated from the cavity of the archenteron by layers of epiblastic and hypoblastic cells between which another variety of cells, the mesoblastic cells, is developing.

At this center there are now the epiblast or ectoderm, mesoblast or mesoderm, and hypoblast or entoderm from which all the tissues and organs of the

fetus are differentiated. These stages are developed within two weeks after conception.

In the development of the human embryo the parts which form for the purpose of connecting the embryo with its host's blood supply or for the purpose of protecting the developing fetus are the extraembryonic portion, while those parts which enter into the formation of the embryo are the intraembryonic portion.

In that manner, the cavity of the archenteron divides, the extraembryonic forming the yolk sac, while the intraembryonic gives rise to the foregut, hindgut, allantois, and also the neurenteric canal which connects the amnion with the cavity of the archenteron.

The amnion grows and finally reaches the allantois which, with the trophoblast, forms the chorion and enters into the formation of the umbilical cord.

The foregut is a closed tube which grows in a cephalic and ventral direction until it approaches the stomodeum. The stomodeum is a depression between the cerebral vesicle and the pericardial area. The stomodeum is separated from the foregut by the oral plate or buccopharyngeal membrane. This membrane breaks during the third week and the stomodeum becomes continuous with the foregut (Fig. 2*B*).

By the fourth or fifth week the stomodeum is surrounded above by the frontonasal process, below by the mandibular processes or the first branchial arches and laterally by the maxillary processes which are offshoots of the mandibular processes (Fig. 2*C*).

According to Janeway* the frontonasal process buds forward with slight depressions on either side to form the median and lateral nasal processes. The central section is called the globular process or median nasal process. The extreme anterior end of the globular process is bifid. From this process arise the brow, bridge of the nose, septum and middle portion of the lip (philtrum) and intermaxillary bones. On either side of the median nasal process is the lateral nasal process which gives rise to the alae of the nose, roof of the nose, cribriform plate of the ethmoid, superior turbinates, and side of the cheek and nares. Separating the lateral nasal process from the maxillary process is a fissure, the nasolacrimal groove, which does not communicate with the stomodeum. The maxillary process grows forward beneath the eyes to join the median nasal process. It forms the superior maxilla, including their frontal processes, and later, the orbit, palatine and alveolar processes, the outer two-thirds of the upper lip and cheek between the eye and the lip. The mandibular process grows and joins its fellow to form the mandible (Fig. 2*D*).

ATTRIBUTED ETIOLOGY OF CLEFT PALATE

The failure of any of these centers to unite will give rise to a cleft of the lip or palate, in rare instances, cleft of the mandible. What causes the failure of union of the parts of the future face and jaws in the embryo is not known. However, among the attributed etiology have been mentioned heredity, super-

*Lecture Notes on Physiology published by Paul Hoeber Medical Book Co., New York City.

numerary teeth in the line of fissure, dipping of the epithelial fold of the dental lamina during its development, imperfect nutrition in the early months of gestation, alleged prenatal maternal impressions, and syphilis.

The most probable cause seems to lie in heredity. As explained previously, the genes in the chromosomes of the spermatozoon and the genes in the ovum contain all the possible inheritable characteristics of the parents and their forebears. Therefore, all these characteristics would be sealed in the combined chromatic elements at the time of fertilization. It would be through this medium, therefore, that cleft palate anomalies would be passed from parent to offspring. In this connection I wish to quote Davis*: "No doubt this recombining of

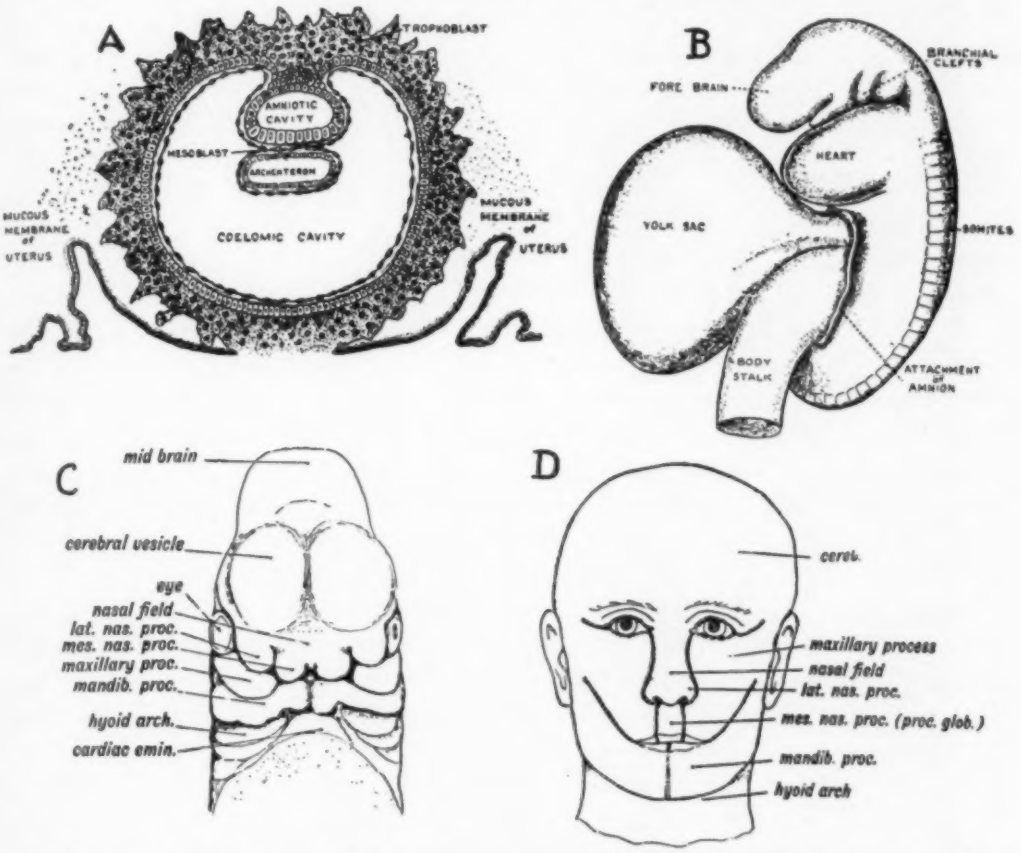

Fig. 2.—*A*, "Showing the origin of the primitive coelom, the mesoblast, and the cavity of the amnion during the development of the human ovum (After T. H. Bryce)." The trophoblast is secured to the mucous membrane of the uterus. At the embryonic center the mesoblastic cells are developing from which, together with the epiblastic and hypoblastic cells, the future embryo will develop. (From Janeway's *Lecture Notes on Physiology*, Courtesy of publishers, Paul Hoeber Medical Book Co., New York.) *B*, "Human embryo 2.5 mm. long, toward the end of the third week of development (Prof. Peter Thompson)." (From Janeway's *Lecture Notes on Physiology*, Courtesy of publishers, Paul Hoeber Medical Book Co., New York.) *C*, "Showing the formation of the face by the nasal, maxillary and mandibular processes in an embryo of the fourth week (After His)." (From Janeway's *Lecture Notes on Physiology*, Courtesy of publishers, Paul Hoeber Medical Book Co., New York.) *D*, "Showing the parts of the face formed from the nasal, maxillary and mandibular processes." (From Janeway's *Lecture Notes on Physiology*, Courtesy of publishers, Paul Hoeber Medical Book Co., New York.)

physical entities through separation of dominant and recessive characters plays an important role in the etiology of cleft palate and harelip for one generation may be entirely free from the deformity only to have it reappear in succeeding

*Davis, Albert D.: Tripartite Cleft Palate and Double Lip in "Identical" Twins, Journal of Surgery, Gynecology and Obstetrics, Nov., 1922.

generations. Family trees of cleft palate and cleft lip cases show that, if heritable it follows no known law, but may affect an entire family, a few, or even single individuals. It is well known that the greatest number are afflicted when both parents either have a family history of cleft palate or are themselves afflicted. Shearer reported a positive family history in 95 per cent of over one thousand cases."

The dipping of the embryonic oral mucosa into the mesoblastic tissues causing cleft palate is explained by Brophy as follows: "Among the many causes that have been assigned for failure of union of the palate within the first two months of embryonic life, the one advanced by the late Dr. C. F. W. Boedecker of Berlin is based upon physiologic and anatomic grounds. We know that in the formation of the teeth, the mucosa dips deep down into the submucous tissue, forms the epithelial lamina which contracts into the epithelial cord at the distal end of which the enamel organ is formed. It is too well known to admit of discussion that a layer of epithelium under certain conditions will form an obstruction to union of tissues which it intervenes. The illustrations (in his text)* clearly present the passage of epithelium deep into the connective tissue on the enamel formation. It seems that Boedecker's theory, namely that this epithelial cord delays union of the parts forming the maxilla and the force exerted by the tongue and mandible from the beginning of the second month until birth and several months later, account for the abnormal elevation of the palatal plates and broad separation of the maxillary bones and the creation of cleft palate." This theory, however, does not explain cleft of the lip and face.

The presence of supernumerary teeth in line of cleft which are often found, as revealed in the x-rays of cases to be reported (Figs. 6*E* and 8*K*), is ascribed as a possible cause, but this also would explain cleft of the alveolar process only and not the cleft of the lip, hard or soft palates.

Imperfect nutrition in the early months of gestation and any factor producing malnutrition in the mother, it is believed, may adversely affect the developing embryo. Hence some believe this may be a factor in producing a condition conducive to failure of union. The presence of amniotic adhesions, it is believed, may have a similar effect.

A common opinion voiced by mothers of cleft palate infants is that they had a fright or severe emotional disturbance during pregnancy. Usually, it is found that the reported unfortunate incident occurred much later than the embryologic time of union of the various primordoria about the stomodeum. This explanation, therefore, should be definitely eliminated.

In the same category is the very much misunderstood role of syphilis in cleft palate. It should be remembered that the *Spirochaeta pallidum* of syphilis is carried mechanically to the fetus and thus infects it. Since congenital syphilis is primarily an infection of the embryo or fetus in utero, the developing cleft palate fetus is just as susceptible to infection as the ordinary fetus. The superimposition of syphilis on the cleft palate embryo could occur and therefore would be not a cause, but an additional burden for the fetus to bear. Should the infected fetus not be aborted but carried to term, then the occurrence

*See Figs. 189-197 in text of Cleft Lip and Palate, T. W. Brophy, P. Blakiston's Son & Co., Philadelphia, Pa.

of so-called "inherited" syphilis in cleft palate babies should be relatively no more prevalent than that found in the luetic newborn without cleft palate. As a matter of fact, there is no evidence which has come to the attention of this writer to show that syphilis is an etiologic factor in cleft palate. The incidence of cleft palate in the luetic is no greater than in the noninfected type.

Should the primordoria about the stomodeum fail to unite in embryo, this failure of union persists throughout the fetal developmental period and is present as a cleft palate at birth. The illustration of a fetus 4½ months after conception shows the fetal head already formed (Fig. 2*E*).

Fig. 2*E*.—Radiograph of pelvis taken four and one-half months after conception showing the head of fetus already developed.

CONGENITAL CLEFT PALATE AND CLEFT LIP

The congenital cleft may be a simple division of the uvulae or it may extend through the soft and hard palates as a fissure or opening frequently involving the alveolar process. Thus the roof of the mouth is not completely formed and there is present a direct communication between the oral and nasal cavities. The cleft may extend forward through the lip thereby dividing the lip into two parts, if a unilateral or single cleft lip, or into three parts, if a bilateral or double cleft lip. The congenital separation in the lip is commonly known as harelip.

The clefts of the hard and soft palates are found in the median line, while the cleft of the lip corresponds to the line of suture of the premaxillary bones. If the cleft of the lip is unilateral, it is seen more frequently to the left than to the right of the median line. However, should the cleft be bilateral, the division will be in line with the premaxillary suture on both sides of the median line.

A cleft may be only of the uvula or of the soft palate or of the soft and hard palates. It may involve the lip only or lip and alveolar process or it may be a combination of all these structures. The unfortunate newborn with a cleft lip and cleft palate deformity presents an unsightly gap in the face extending to the oropharynx.

The group of muscles composing the soft palate is separated into single muscles by the cleft, instead of being paired and joined in the median raphe with its fellows of the opposite side as is found in the normal newborn.

Similarly in the hard palate the horizontal plates of the palate bones and the palatal processes of the maxillary bones fail to unite and the mucous membrane covering these bones does not extend across the breach thus formed, but is continuous with the nasal mucosa. The vomer may be detached or may be joined to one side of the cleft hard palate.

The cleft of the lip likewise divides the continuity of the lip muscles. Associated with the cleft palate deformity the muscular action results in perverted stimulation and aggravated distortion of the facial muscles and displacement of the alae of the nose.

The tongue which normally rests against the palate will lie against the cleft palate opening or may even force itself into it and act as a wedging force in accentuating the palatal deformity.

It is evident that the cleft palate infant is at a disadvantage to suckle its food at the very outset of neonatal life. The unfortunately deformed infant is also a source of much misery to its parents.

Undoubtedly, something must be done as soon as possible to correct the cleft defect. In view of the results obtained through surgery, the primary avenue of relief would be through a series of plastic operations. Thus the separated lip muscles could be paired and united and the facial contours restored to simulate normal appearance. Similarly the soft palatal muscles can be paired and united and the hard palate closed. Thus the normal functioning of the lip can be restored and eventually that of the palates.

Considering the esthetic, anatomic, and functional improvements, most operations are successful. Nevertheless, the results obtained do not always come up to our hopes or meet with all our expectations. It should be realized that human efforts have limitations and that tissue repair reactions are uncertain. Nor are the plastic operations alone adequate fully to prepare the mouth and teeth for normal function. It must be remembered that all factors, such as missing teeth, etc., which produce irregularities in the normal child also operate and contribute to the causation of malocclusion in the cleft palate child. There is also present an interference with normal development and interstitial growth of the maxillary and palate bones and their processes due to perverted function or to disturbed bony proliferation centers through inflammation and surgery.

By supplementing surgery with orthodontic care, it is believed that the improvement of tooth function will be materially aided.

In general, orthodontic patients with cleft palates and particularly those with complete cleft lip (harelip) and cleft palate require special consideration in that:

1. Missing permanent maxillary teeth aggravate the irregularity in the contracted maxilla.

2. The contracted maxillary arch, therefore, cannot harmonize in the number of opposing teeth, nor in size with the mandibular arch, nor in its position as related to the face and cranium.

3. Contraction of the maxillary lip necessitates lip support for lip stretching.

4. Perforation persisting in the hard and soft palates following plastic repair requires immediate relief, especially in conjunction with obturator construction, to facilitate tongue exercises and speech training instead of awaiting the completion of orthodontic treatment.

In planning and designing appliances every suitable device should be utilized to restore all structures to as nearly a normal anatomic relationship and function as possible. We advocate, therefore, whenever possible, the combining of the obturator with the orthodontic appliance at the very outset of treatment. In that way it is possible to seal or bridge over the opening with the obturator and, as progress is achieved and sufficient space gained, to use the obturator as a base to which artificial teeth can be added. The obturator often re-enforces the banded anchorage for the appliance by supplying a tissue-bearing auxiliary support.

Each case must be considered for its own individual requirements. The appliance designs to be described were not based upon any one system or method of orthodontic practice, but rather on a combination of methods including Kingsley, Coffin Split Plate, Jackson, Case, Angle, Mershon, etc.

Most of the cases to be reported were selected for the purpose of demonstrating the need for combining the orthodontic appliance with the obturator. It must be borne in mind, however, that not all cleft palate cases operated upon have perforations in the line of union. Nor do all cases require obturators or velums, although most require orthodontics.

CLEFTS OF THE HARD AND SOFT PALATES

The cases immediately to follow involved clefts of the hard and soft palates. The plastic repair operations by Dr. Burdick* produced beautiful results both from an anatomic and a physiologic viewpoint. Accordingly, no obturator was needed. After speech training the patient's enunciation became favorable.

CASE 5, a girl, aged 11, was born with a congenital cleft of the hard and soft palates. She had chicken pox, measles, whooping cough, and mumps. Her tonsils and adenoids were removed. As a baby she was bottle fed using a large nipple with a large opening in it. She was operated upon three times. Her palate was beautifully repaired and the hard and soft palates closed.

*Director of the Fourth Surgical Division, Bellevue Hospital, New York; Chief of the General Surgical Service, Hospital for the Ruptured and Crippled, New York.

Examination revealed a mutilated neutroclusion with complete linguoversion of the left maxillary central and left maxillary lateral incisors and linguoversion of the left mandibular canine. The lower right molar was missing (Fig. 3*A* and *D*).

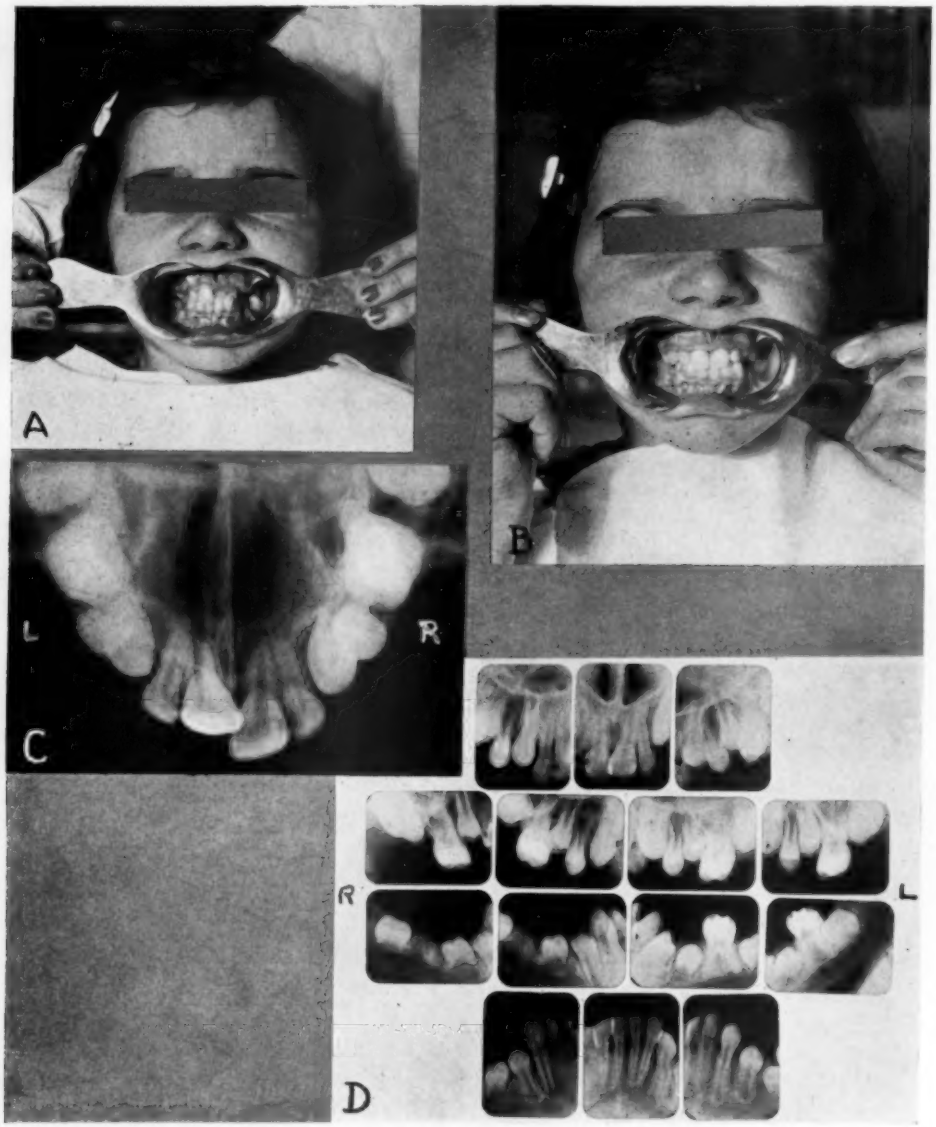

Fig. 3.—*A*, Occlusion before orthodontic treatment. *B*, Occlusion after orthodontic treatment. *C*, Occlusal x-ray view showing large bony cleft of hard and soft palates involving both sides of septum. *D*, Full mouth x-ray series of teeth before treatment showing effect of early extractions.

Roentgenographic examinations were made of the profile of the skull (Fig. 3*E*), full mouth series of the teeth (Fig. 3*D*), occlusal view of the maxillary teeth (Fig. 3*C*), wrist (Fig. 3*F*) and ankle (Fig. 3*G*). Except for the occlusal film which revealed the cleft involving both sides of the septum, the films revealed no unusual information.

To bring the maxillary teeth into normal alignment the maxillary molars were banded and buccal tubes soldered to them into which was fitted an 18-gauge

labial arch with molar spring stops. On the mandibular arch the left molar was banded and a one-half round tube and inclined plane soldered to its lingual surface. The right canine was banded and a vertical all-round tube soldered to its lingual aspect. A lingual arch was contoured which terminated in a clasp fitting over the right canine. A one-half round post and spring locking device were soldered on the left side while on the right an all-round post was used and the locking spring made to engage the cervical end of the round post.

The maxillary and mandibular teeth are now in normal alignment (Fig. 3*B*).

Case 6, girl, aged 9, had a congenital cleft of the hard and soft palates. She had been operated upon when quite young and a secondary repair operation was subsequently performed by Dr. Burdick (Fig. 4 *A* and *B*). As a child she was undernourished and had had whooping cough. Examination showed an open-bite and an abnormal frenum (Fig. 4*C*). The roentgenograph of the teeth revealed the maxillary lateral incisors missing. The profile view of the skull (Fig. 4*E*) was negative, while the views of the wrist (Fig. 4*F*) and ankle (Fig. 4*G*) indicated normal osteogenetic development.

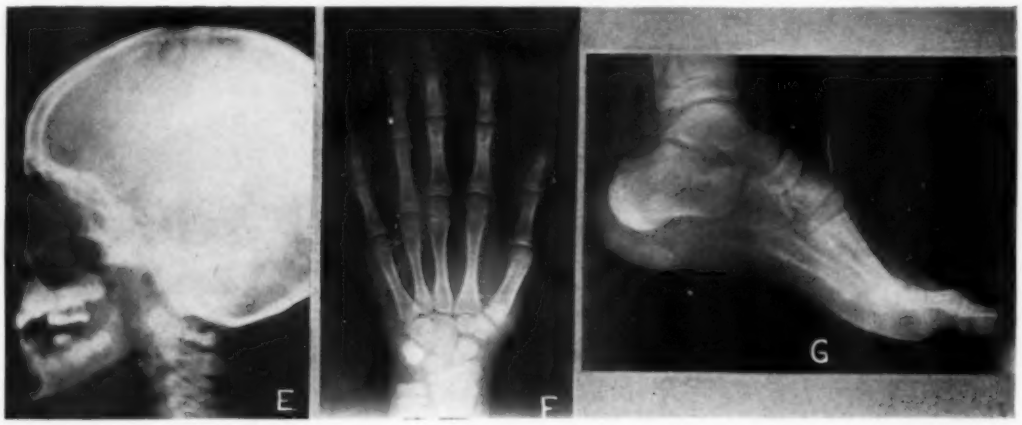

Fig. 3.—*E*, Profile x-ray of head negative. *F*, X-ray of wrist reveals normal osteogenetic development. *G*, X-ray of ankle reveals normal osteogenetic development.

Since there was a good functioning soft palate and the hard palate was completely closed, we attempted to correct the open-bite deformity and diastema. To accomplish our purpose all four permanent molars and both maxillary central incisor teeth were banded. Maxillary and mandibular labial alignment arches were made and the molar anchorages re-enforced with lingual arches.

The maxillary central incisors were brought down to occlude with their mandibular antagonists correcting the open-bite. The abnormal frenum appears to have been eliminated (Fig. 4*D*).

COMPLETE UNILATERAL CLEFT OF LIP AND HARD AND SOFT PALATES

In patients with complete unilateral cleft lip and palate a number of permanent tooth germs may be congenitally absent especially the maxillary second premolars. Hence these permanent teeth never form. This condition in the maxilla may be aggravated by permanent teeth lost in the line of cleft.

Due to the deformity and the missing teeth the maxillary arch is contracted. Thus there is produced a disharmony in the sizes of maxillary and mandibular arches and nonfunction of some or most of these teeth, thereby seriously interfering with mastication.

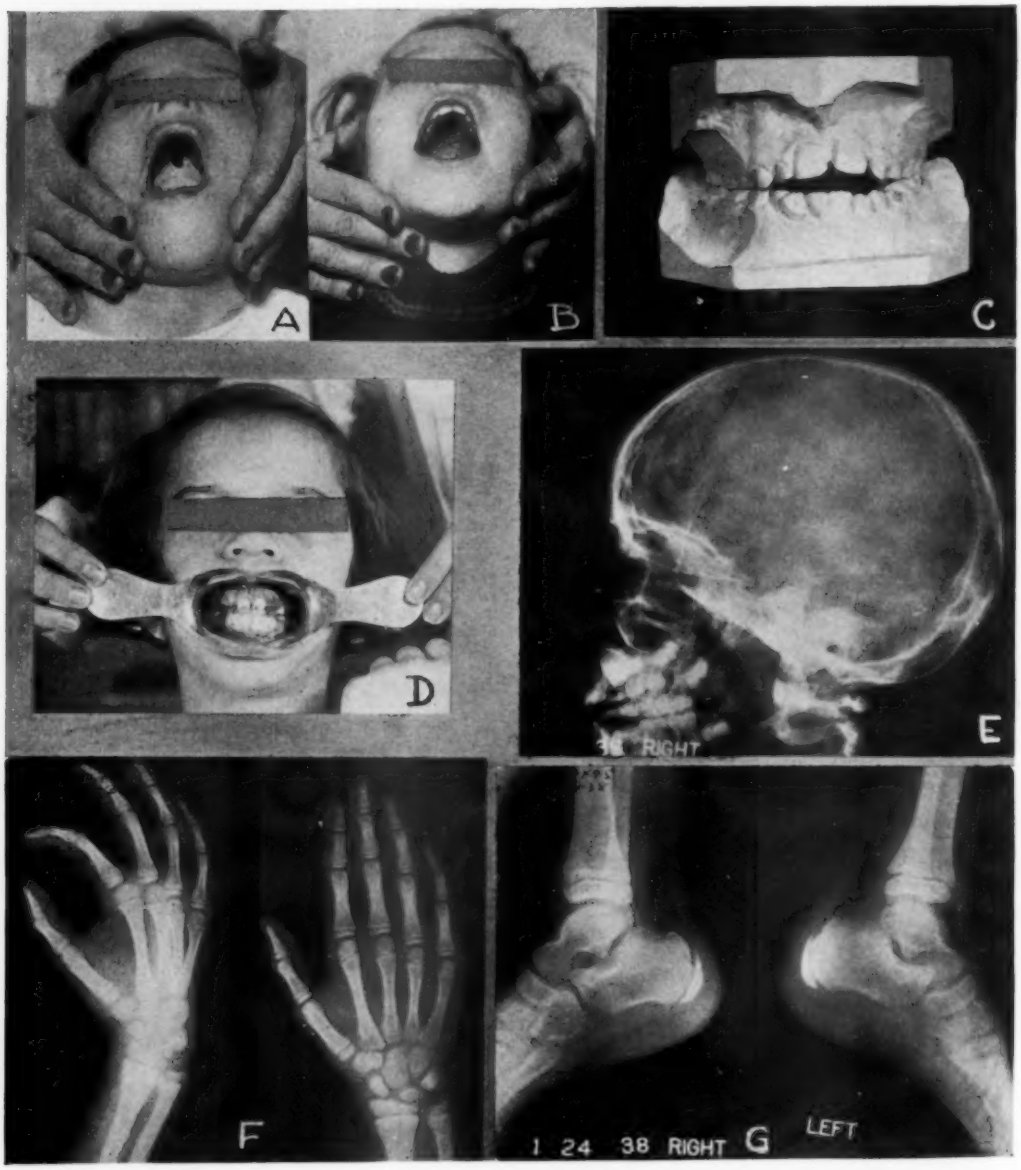

Fig. 4.—*A*, Perforation remaining in palate before secondary repair of cleft in hard and soft palates. *B*, Perforation in palate closed after secondary repair operation. (Courtesy of Carl G. Burdick, M.D.) *C*, Models showing open-bite before treatment. *D*, Showing progress with opposing teeth now in contact. *E*, Profile x-ray photograph of skull appears to be negative. *F*, X-ray photograph of wrist shows normal osteogenetic development. *G*, X-ray photograph of ankle showing normal osteogenetic development.

Following plastic repair operations, perforations may be found in the line of cleft. These openings vary in size and location, but are usually in the line of the original cleft. The maxillary anterior teeth present are retruded and give the impression of a mesioclusion.

Because of the latent speech habits and the persistence of communications between the oral and nasal cavities, it is advisable to combine the obturator with the orthodontic appliance. Thus the perforations can be closed mechanically and at the same time a means provided for expanding the maxillary arch in order to bring the teeth into proper alignment and occlusion. As sufficient space is opened additions of teeth to the obturator can be made to replace those teeth that are missing. An appliance is also inserted to stimulate growth in the mandible. Thus the size, shape, and relationship of the arches can be harmonized and a good-functioning occlusion anticipated. Cases to illustrate follow:

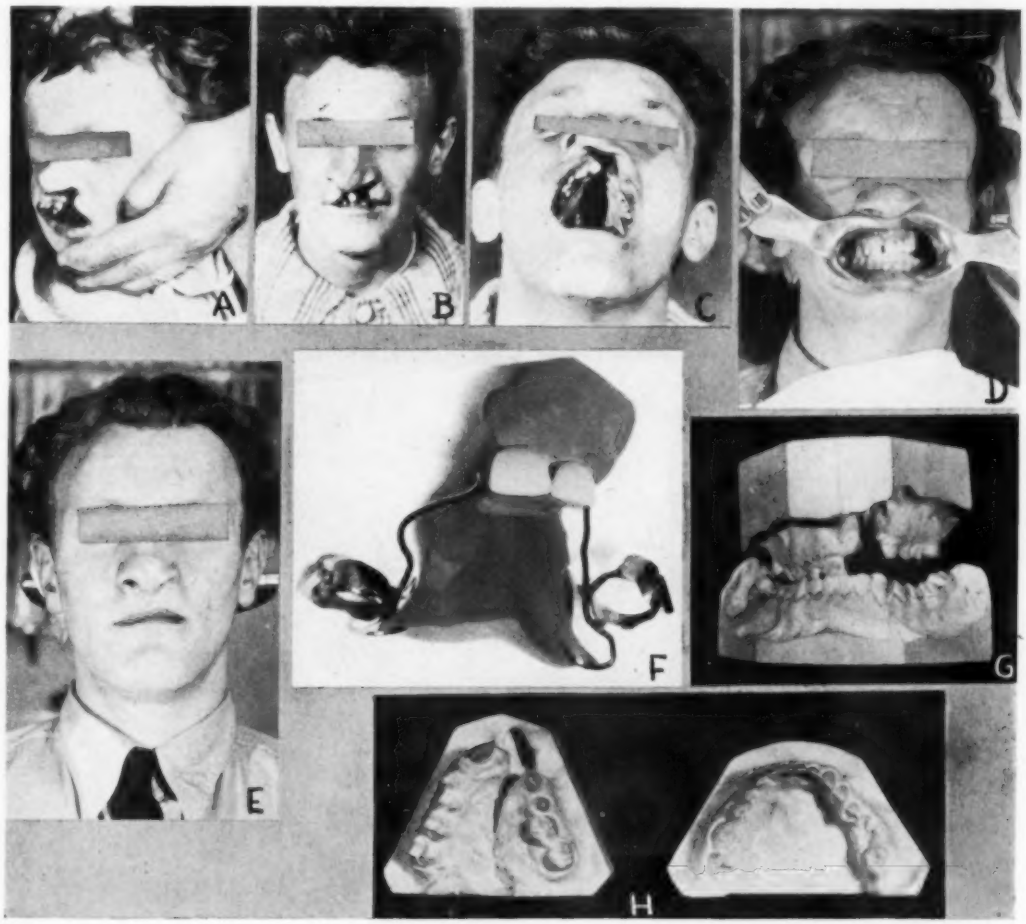

Fig. 5.—*A*, Photograph of patient at age of 3 years. (Courtesy of Carl G. Burdick, M.D.) *B*, Front view of patient before operation. (Courtesy of Carl G. Burdick, M.D.) *C*, View of palate with mouth open before operation. (Courtesy of Carl G. Burdick, M.D.) *D*, View of teeth in occlusion showing progress. Combined obturator and orthodontic appliance in position carrying three anterior teeth. *E*, Front view of patient after plastic repair. Appliance in position. *F*, Photograph of original combined obturator appliance carrying two anterior teeth. *G*, Models in occlusion. Note especially the infraclusion of left maxillary teeth. *H*, Occlusal view of same models.

Case 7, a man, aged 18, gave a history of a congenital cleft of the lip, hard and soft palates. He had been operated upon unsuccessfully when one year old (Fig. 5 *A*, *B*, and *C*). His illnesses were scarlet fever, whooping cough, chicken pox, measles, and mumps. When 16 years of age, he underwent a series of operations by Dr. Burdick for the repair of his cleft lip and cleft hard and soft palates with a beautiful result.

Examination of his mouth revealed a malocclusion mutilated by the absence of the maxillary left central incisor, maxillary left lateral incisor, maxillary left premolar, maxillary right second premolar. He had an open-bite with complete nonfunction of the left maxillary and mandibular teeth (Fig. 5 *G* and

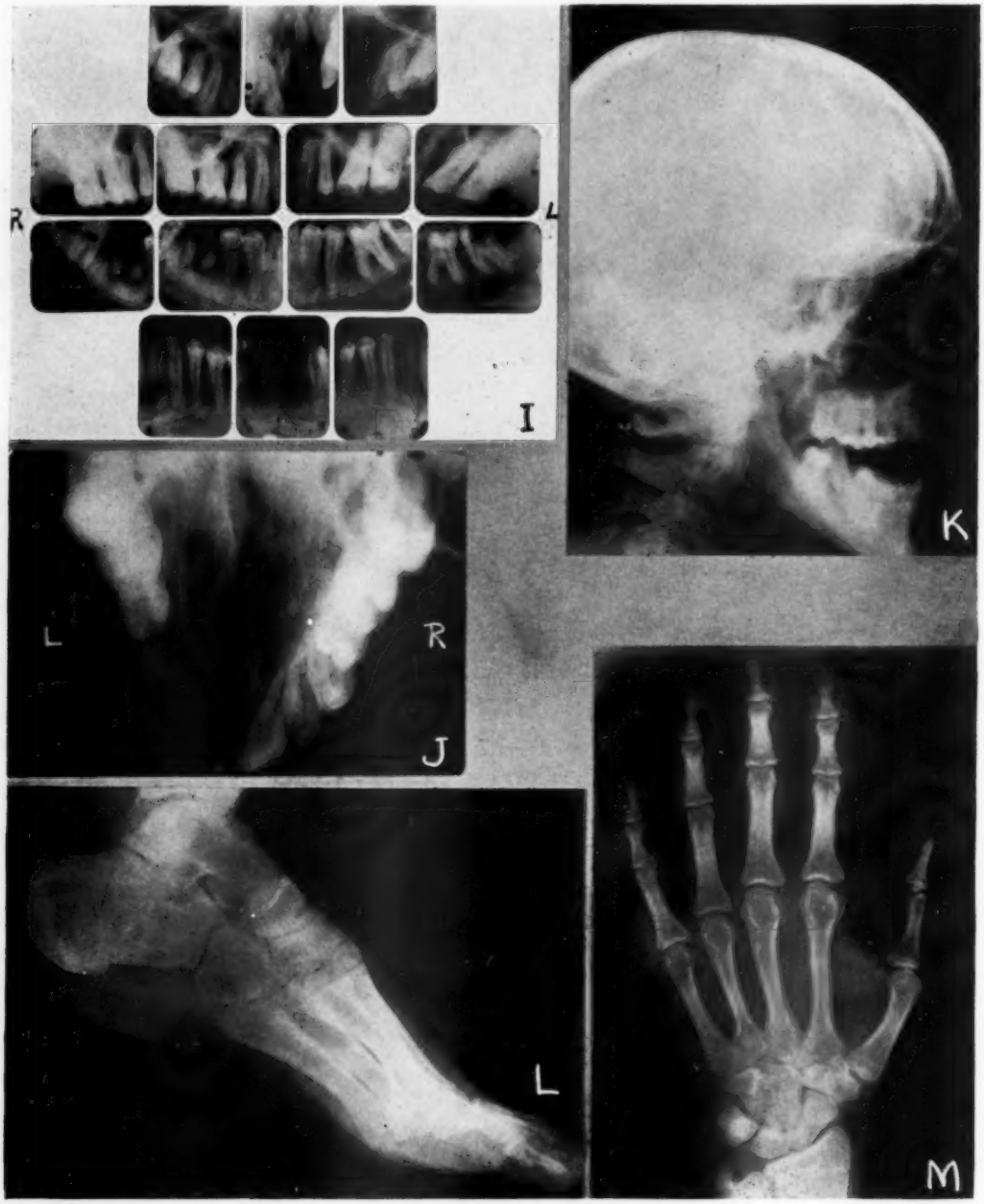

Fig. 5.—*I*, Full mouth x-ray series. *J*, Occlusal x-ray view showing bony clefts involving nasal fossa. *K*, Profile x-ray of skull showing maxillary osteo-deficiency. *L*, X-ray of ankle showing normal osteogenetic development. *M*, X-ray of wrist showing normal osteogenetic development.

H). The soft palate was well formed, soft, and movable. The posterior part of the hard palate was united, but in the mesial third of the hard palate, including the alveolar process, the cleft persisted communicating with the inferior

nasal meatus (Fig. 5 *I* and *J*). The lip and nose were nicely repaired, but the left ala nasi was depressed because of lack of bony support.

Roentgenographs of the profile of the skull (Fig. 5*K*) showed a bony deficiency of the maxilla. Roentgenographs of the wrist and ankle revealed normal osteogenetic development (Fig. 5 *L* and *M*).

In designing the appliance the advantages of the obturator together with the orthodontic appliance were borne in mind. This combined orthodontic appliance and obturator consisted of molar bands, to each of which, on its lingual surface, was soldered a vertical all-round tube and inclined plane for the reception of an all-round post and locking device from the lingual body wire. The body wire was contoured and its arms extended forward to engage the lingual surfaces of the maxillary teeth and to provide the necessary stimulation for expansion. To the palatal body wire a skeleton framework was arranged to support the obturator (Fig. 5*F*). The obturator sealed the opening between the oral and nasal cavity, while its anterior flange raised the patient's depressed maxillary lip (Fig. 5*E*) and supplied some of his missing teeth.

The patient was taught how to remove, cleanse and reinsert the apparatus. At the present time his maxillary teeth are functioning better. Progress can be noted in that sufficient space has been gained to add another anterior tooth to the obturator (Fig. 5*D*). The patient's enunciation has improved. His appearance has also improved. While his mental and social uplift must be credited primarily to the cleft lip and palate plastic operations, yet the orthodontic follow-up has aided materially in continuing this improvement.

Case 8, a boy, aged 16, gave a history of congenital cleft lip and cleft of the hard and soft palates. He began to walk at 1½ years and to talk at 4 years. His infancy presented the usual nursing problems. His lip was operated upon at 9 months; palate at 15 months and again six months later. Because of the tightness and deformity of his upper lip at the age of 15, he was referred to Dr. Burdick who performed an Abbé plastic of the lip.

Examination of his mouth revealed the soft palate successfully closed, the mucous membrane covering the hard palate approximated but not completely united. The suture extended from the junction of the hard and soft palates in the median line forward toward the left and continued through the alveolar process to the mucolabial fold. The patient presented what resembled a neutroclusion mutilated by missing teeth with linguoversion of the left maxillary molar, premolar, canine, the right central incisor, and right lateral incisor. The left cuspid was within 5 mm. of the right central incisor. All his left maxillary teeth were in infraclusion causing an open-bite (Fig. 6 *A* and *C*). The right maxillary teeth were in linguoversion. The x-ray series of his teeth revealed a supernumerary tooth in line of cleft (Fig. 6*E*) and the maxillary left second premolar and maxillary right first molar were missing.

An appliance was designed for expansion of the maxillary arch and to open spaces for missing teeth and to provide an obturator to seal the openings in the palate. The maxillary left first molar and right second molar were banded. The skeleton base provided the attachments for the obturator. All round posts

and spring locks were attached to the body wire. These fitted into their respective left and right tubes and inclined planes soldered to the lingual of the molar bands. As soon as sufficient space between the right central and left cuspid was achieved, a left central incisor was added with a labial flange to provide a basis for raising the lip and also a means for lip exercise. As the space was increased, another tooth, a left lateral, was added. The left maxillary teeth have been brought into normal buccal relationship to the mandibular teeth and are now almost in complete occlusion (Fig. 6 *B* and *D*). The flange of the

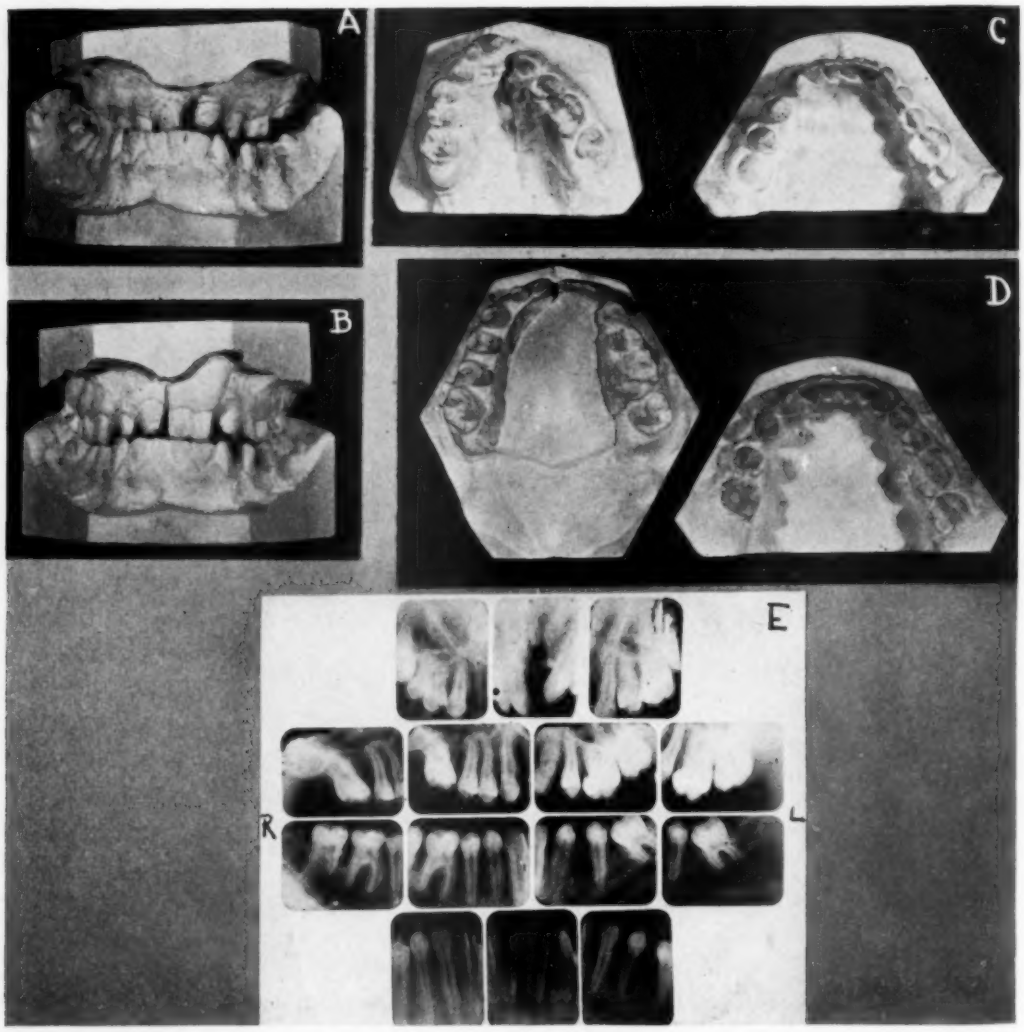

Fig. 6.—*A*, View of models before orthodontic treatment showing infra- and linguoversion of left maxillary teeth and the linguoversion of right maxillary teeth. *B*, View of models showing progress. *C*, Occlusal view of models before orthodontic treatment. *D*, Occlusal view of models during treatment showing obturator-appliance in position. Note progress sufficient for addition of two anterior teeth. *E*, Full mouth series of x-rays before treatment. Note supernumerary tooth in line of cleft and absence of maxillary left second premolar, left lateral incisor, left central incisor and maxillary right first molar.

obturator-appliance has raised the lip and through exercise the Abbé transplant from the lower lip to the upper lip has improved in function. Speech training with the obturator-appliance in position has improved his enunciation which is now almost normal.

CASE 9, a boy, aged 14, was born with a congenital cleft lip and a cleft of the hard and soft palates. He was breast fed for four months and bottle fed thereafter. His childhood illnesses were pneumonia, measles, and mumps. His tonsils were removed at the age of three. His lip was closed by operation when four days old. His palate was operated upon when three months old, again when three years old and a last attempt was made at the age of ten. The palate operations were only partially successful.

He was backward in his schoolwork probably due to his incomprehensible enunciation and the need for individual instruction which his teachers, probably overburdened with large classes, were unable to give him. He was timid and lacked friends.

At the time of examination he presented a badly mutilated occlusion with the following teeth missing: maxillary left central and lateral incisors, left first and second premolars, maxillary right lateral incisor, right first and second premolars. The mandibular left first permanent molar and right first permanent molar were badly broken down and abscessed. The maxillary left canine, the maxillary right central incisor were within 4.5 mm. of each other and with the right canine were in linguoversion, while the molars were in buccoversion. The lower anterior teeth were crowded. The mandibular right central was in contact with the mandibular right canine, the right lateral incisor being in complete linguoversion (Fig. 7 *A* and *C*).

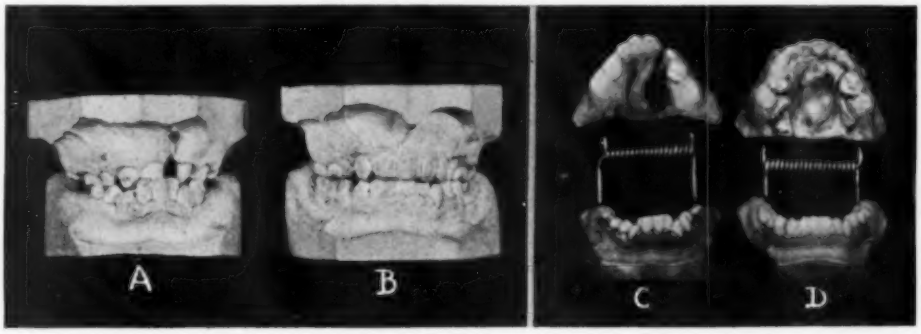

Fig. 7.—*A*, Models before orthodontic treatment. *B*, Models after orthodontic treatment. *C*, Models before treatment showing occlusal view. *D*, Models after orthodontic treatment showing occlusal view with obturator in position.

His gums were hypertrophied, spongy, and hemorrhagic. His face was asymmetric. There was a lack of development of the left maxillary region which accentuated the cleft lip scar and the depression of the left ala nasi. A large elliptical cleft in the hard palate communicated with the nasal cavity.

"A lingual appliance was constructed in the maxillary arch for the purposes of widening this arch to bring the right central incisor and left cuspid from lingual into normal occlusion, and to separate these teeth so that sufficient space might be gained to supply missing teeth. Accordingly, bands were made for the maxillary molars to each of which an 18-gauge all-round vertical tube was soldered on the lingual surface. Distal to each tube an inclined plane was soldered for the reception of the lingual appliance locking device.

"A lingual appliance was constructed with recurved finger springs and locking devices. Across the palatal body wire was soldered a skeleton base

around which was vulcanized an obturator. This obturator served the patient in his speech training and separated the nasal from the oral cavity. On the mandibular arch the usual labial and lingual appliances were used.

"For the purpose of retention an obturator supplying missing teeth and attached to the maxillary molar bands was constructed. Later a gold obturator was made (Fig. 7*D*). He now has a good functioning occlusion (Fig. 7*B*). The patient has been treated intermittently for four years. The combined orthodontic and prosthetic treatment assisted in his development. His appearance is markedly improved. His voice and enunciation are so much better than they were at the start that his reticence and timidity have been largely overcome. He takes more interest in life. At present he is self-supporting. Indeed, the improvement in the young man's social and economic status is as great, if not greater, than the improvement in his appearance and condition of his mouth."*

COMPLETE BILATERAL CLEFTS OF THE LIP, HARD AND SOFT PALATES COMPLICATED BY MISSING PREMAXILLA

In complete clefts of the lip involving both the hard and soft palates, the former practice of removing the premaxilla resulted in a considerable sacrifice with loss of bony support for the contracted lip and aggravated the contracted maxilla. In the cases to be cited this necessitated the Abbé plastic transplant of a section of the lower lip to the upper lip for the purpose of giving the upper lip more substance. This operation relieves the taut maxillary lip. By extending flanges from the obturator to support the lip and combining it with the orthodontic appliance much relief is given the patient.

Case 10, a girl, aged 7, was born with a complete cleft lip and palate. Her oldest brother had a harelip. Her premaxilla was absent. She began to walk at 15 months and to talk at 2 years. She had had whooping cough at 6 years. Her lip was operated upon when 3 days old. At the age of 7½ years her hard and soft palates were closed by Dr. Burdick. An Abbé operation also was performed on the lip (Fig. 8 *A*, *B*, and *C*).

Upon examination we found her premaxilla absent and all her six maxillary anterior teeth missing (Fig. 8 *F*, *G*, and *H*). The space between the mesiolingual of her upper left first deciduous molar and mesiolingual of her maxillary right first deciduous molar measured 16 mm. Her palate was narrowed and the dental arch contracted. The soft palate was well shaped and flexible. The posterior of the hard palate was closed, but there was a perforation in the mucolabial fold which communicated with the nasal cavity. Her lip was taut and the mouth opening was considerably smaller than normal.

Roentgenograms of the teeth disclosed a supernumerary anterior tooth in the line of cleft (Fig. 8*K*). Profile roentgenographs of the skull showed a small but normal sella turcica (Fig. 8*L*). Wrist and ankle films were normal for osteogenetic development (Fig. 8 *M* and *N*).

Our problem in appliance design required that we provide a means for expansion of the maxillary arch, a support for lip stretching, a base to attach and supply missing teeth, a seal for the perforation in the mucolabial fold, to assist

*Lifton, Jacob C.: Combined Orthodontia and Prosthetic Treatment of a Cleft Palate, *Dental Items Interest*, July, 1930.

in mastication, to act as an aid in speech and at the same time to have the entire procedure result in improvement in her esthetic appearance.

Fig. 8.—*A*, Palatal view showing cleft of hard and soft palates. (Courtesy of Carl G. Burdick, M.D.) *B*, Front view before Abbé graft. (Courtesy of Carl G. Burdick, M.D.) *C*, Profile view before Abbé graft. (Courtesy of Carl G. Burdick, M.D.) *D*, Front view after operation with appliance in position. *E*, Profile view after operation with appliance in position. *F*, Moulage showing view of mouth with premaxilla absent. *G*, Front view of models in occlusion. *H*, Occlusal view of models. Note length of soft palate. *I*, View of teeth in occlusion with appliance in position.

To accomplish the above we utilized the principle of the Coffin split plate. Accordingly, a removable instrument combining the orthodontic appliance with a split obturator was constructed. Crib clasps fitted over the second temporary molars provided retention, while arms were prepared for supporting

a split plate with four unusually small teeth. The crib clasps were joined posteriorly by a W-shaped spring (Fig. 8*J*). On the mandible a lingual appliance was constructed banding the first molars and soldering to each band half-round tubes and inclined planes for the reception of the half-round post and spring locking device for the lingual appliance.

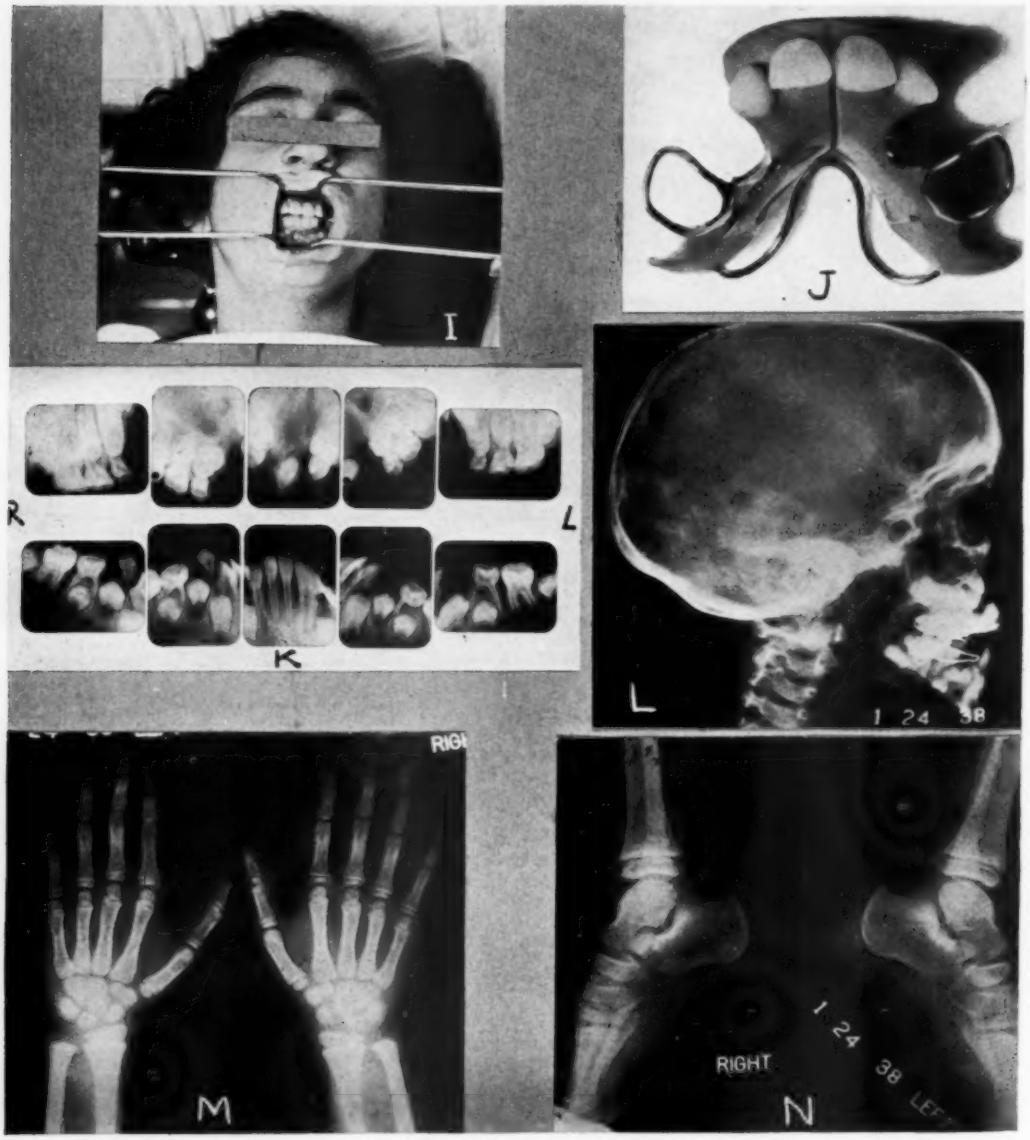

Fig. 8.—*J*, Initial appliance utilizing Coffin split plate principle. *K*, Full mouth x-ray series showing cleft in midline from canine to canine. Note supernumerary tooth in midline. *L*, Profile view of skull showing appliance in position, and a small but normal sella turcica. *M*, X-ray of wrist reveals normal osteogenetic development. *N*, X-ray of ankle reveals normal osteogenetic development.

Sufficient improvement was gained to enable us to modify her appliance by substituting four normal sized anterior teeth in place of the previously unusually small teeth (Fig. 8*I*). In the second appliance the permanent first molars were used as anchorage. The child's lip has become more resilient (Fig. 8 *D* and *E*). A favorable change is noticeable in her general demeanor and enhanced appearance.

CASE 11, a girl, aged 7½, was born with a complete bilateral cleft lip and palate. Of the childhood illnesses she had had chicken pox. She had had a cleft lip (harelip) secondary repair at an early age and an Abbé graft recently.

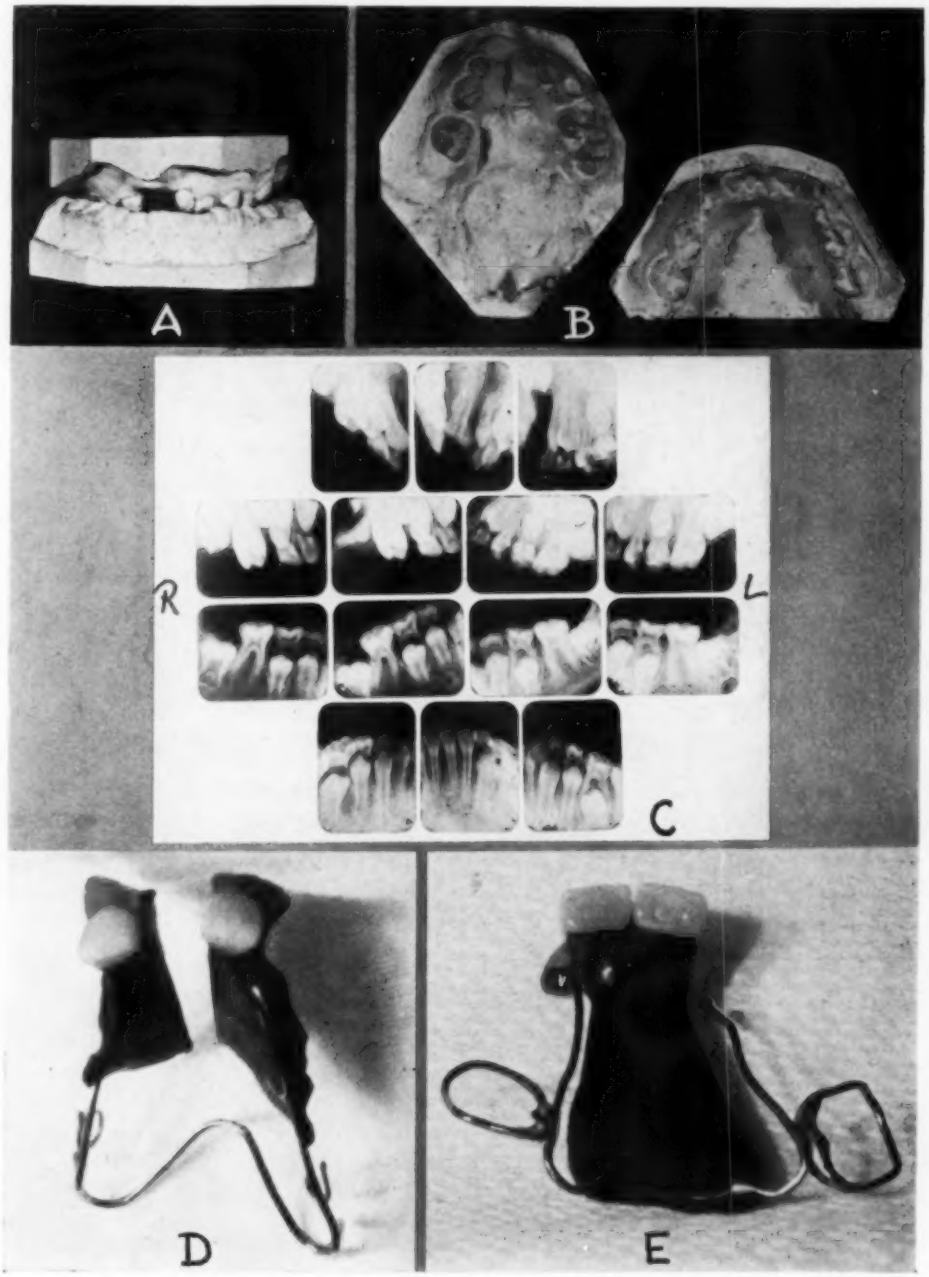

Fig. 9.—*A*, Models of teeth in occlusion showing contraction of maxilla and missing premaxilla. *B*, Occlusal view of models. *C*, Full mouth x-ray series of teeth revealing cleft on both sides of nasal septum. Sequestrum appears to be present in maxillary central incisor region. *D*, Original fixed-removable appliance with split plate and teeth. *E*, Obturator combined with appliance of removable type.

She presented upon examination a taut upper lip unsupported by a maxillary alveolar process. Her maxillary arch was considerably contracted and narrowed. Two maxillary central incisors and two maxillary lateral incisors

were missing (Fig. 9 *A* and *B*). A perforation hidden by a mass of cicatricial tissue could be probed at the mucolabial fold in the region of the right lateral incisor (Fig. 9*C*).

A combined orthodontic appliance and obturator was made to expand her maxillary arch and increase the space between her deciduous canines and, at the same time, serve as a basis for lip stretching and for restoring lip function. Temporarily it provided small-sized teeth which aided in speech, speech training, and lip function.

The appliance consisted of upper molar bands. Each band had an all-round vertical tube and inclined plane soldered to its lingual surface. The lingual appliance was such that the body wire had a W-shaped spring posteriorly. Vertical posts and spring locking devices which fitted into the tubes and under the inclined planes attached to the bands were soldered to the arms of the appliance. Anteriorly, the arms terminated in a split-plate-obturator arrangement with a labial flange to which teeth were added (Fig. 9*D*).

Since improvement in the width of her arch now permitted the replacement of her small-sized teeth with larger and better shaped ones, a new appliance was constructed. At this time advantage was taken of the modification in appliance to facilitate cleansing at home by making a second appliance of a removable type. It consisted of crib clasps on the molar teeth joined to the lingual body wire and an obturator arrangement for the flange to support the lip and to aid in lip stretching exercises. Arms were extended forward from the crib clasps for lateral expansion (Fig. 9*E*).

COMPLETE BILATERAL CLEFT OF THE LIP AND PALATE

In another group of cases of double or bilateral cleft of the lip, hard and soft palates often we find the upper lip tight. Despite careful surgery, perforations may be found in the line of union following the operations. This is especially true of openings in the hard palate in which the defect eliminated part of the roof of the mouth. Normally, the movements of the tongue are restricted by the vault of the mouth. During normal mastication the tongue rolls the bolus of food from side to side and mixes it with saliva preparatory to deglutition. Unless the communication between the oral and nasal cavity is closed or sealed, the faulty tongue habits will persist and the normal benefits of tongue function will not be available.

To reduce the pronounced prolabium it may be necessary to remove a triangular or rectangular section of the vomer. As a consequence the premaxilla is usually free, loose, and movable. When both clefts of the lip are closed at the same time in one operation, the tightness of the resulting lip forces the premaxilla backward.

Case 12, a girl, aged 6½, was born with a bilateral cleft lip and cleft palate (Fig. 10 *A* and *B*). She had been operated upon when 8 months old and again when 6½ years at which time her hard and soft palates were closed (Fig. 10 *C* and *D*).

She presented upon examination a movable premaxilla with unerupted teeth in it and supernumerary teeth in the line of cleft (Fig. 10*E*). An appliance was designed to widen the maxillary arch, to guide the unerupted teeth into

their proper positions, to seal the perforations in the palate, to stabilize the premaxilla and to aid in speech.

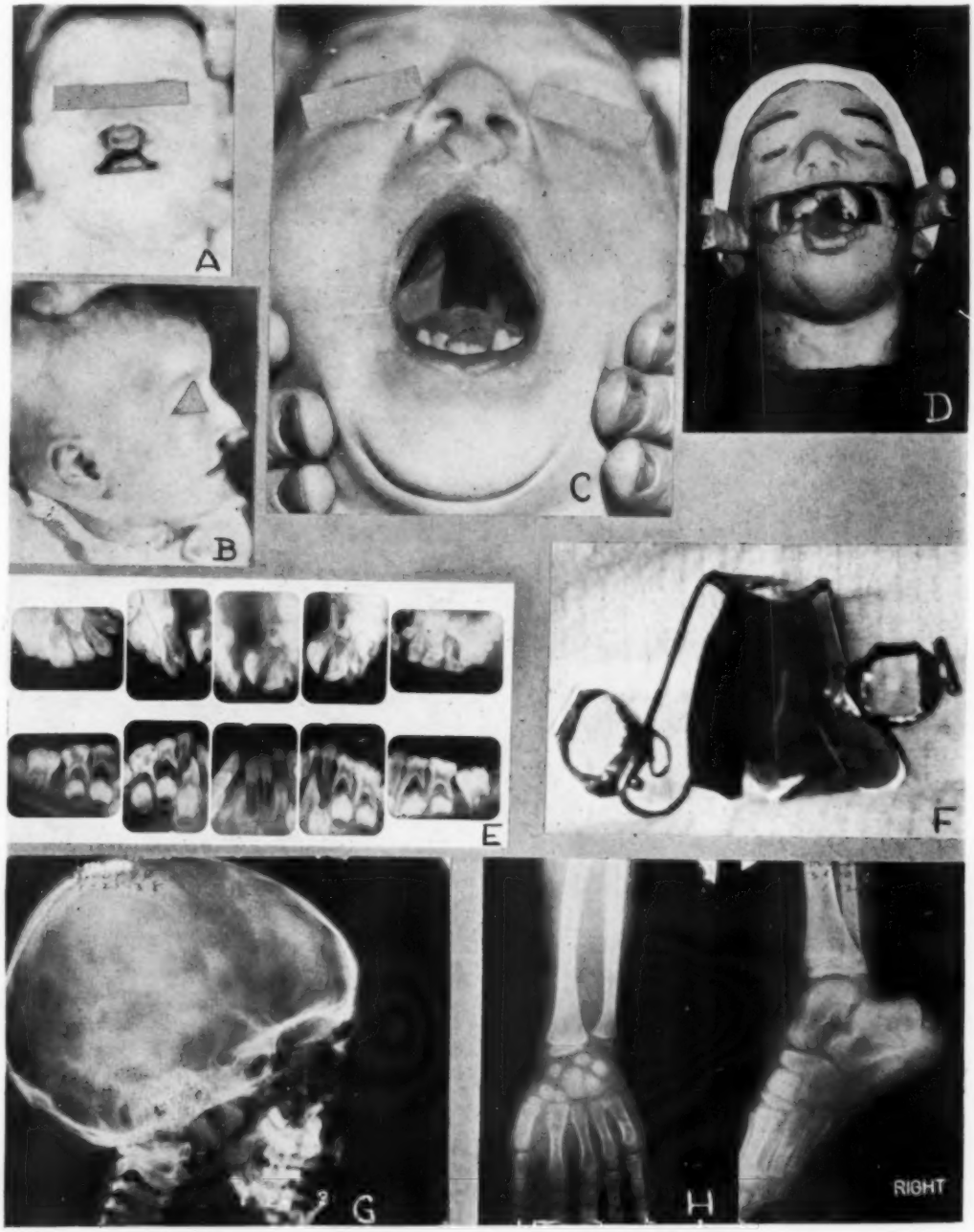

Fig. 10.—*A*, Front view of baby with bilateral cleft of lip and palate. (Courtesy of Carl G. Burdick, M.D.) *B*, Profile view of baby with bilateral cleft of lip and palate. (Courtesy of Carl G. Burdick, M.D.) *C*, Cleft of hard and soft palates before palate repair and revision of lip (still to be done). *D*, Moulage showing repaired hard and soft palates. *E*, Full mouth x-ray series revealing cleft on left side to be deeper and wider than on the right, also active calcification of right lateral incisor. Central incisors are at right angles to normal tooth axis. *F*, Photograph of appliance combined with obturator. *G*, Profile x-ray of skull. *H*, X-ray of wrist shows normal osteogenetic development. X-ray of ankle reveals the beginning of ossification of epiphysis of os calcis.

A profile roentgenograph of the skull was negative (Fig. 10*G*). Wrist and ankle roentgenograph showed normal osteogenetic development (Fig. 10*H*).

The combined orthodontic appliance and obturator was constructed utilizing the maxillary second deciduous molars for bands. Each band had an all-round vertical tube and inclined plane soldered to its lingual surface for the reception of the vertical post and locking device from the lingual body wire. The body wire had a skeleton base soldered to it for the support of the obturator (Fig. 8*F*). Favorable progress enabled us to solder additional finger springs to the obturator appliance and also to make a labial appliance with spring stops which fitted into buccal tubes soldered to the molar bands. The child's mother was taught how to remove the appliance, cleanse it, and reinsert it.

There was considerable improvement in dental growth. The permanent maxillary central incisor teeth have erupted and are now being directed into their proper positions.

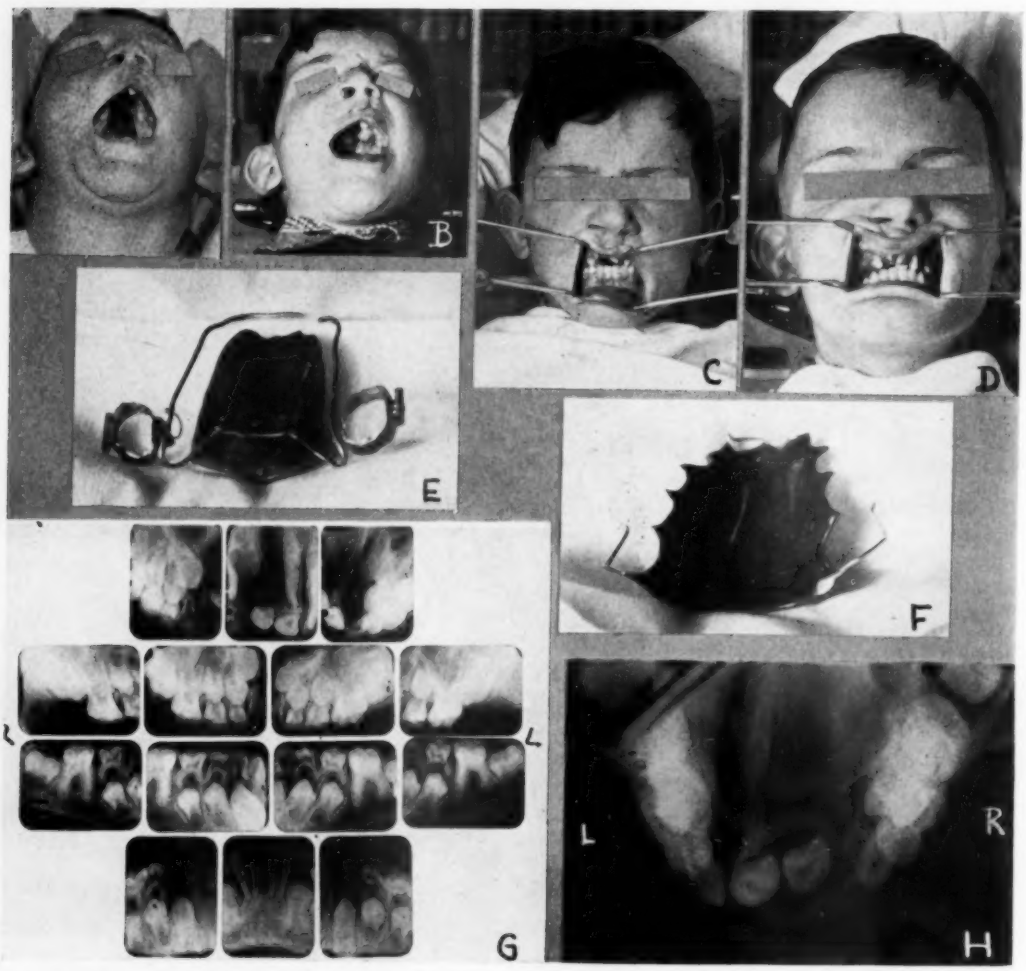

Fig. 11.—*A*, Cleft of hard and soft palates before operation. (Courtesy of Carl G. Burdick, M.D.) *B*, Cleft soft palate closed by operation. Hard palate still to be repaired. *C*, Teeth in occlusion before treatment. Note position of left central which is visible, while right central is horizontal and not visible. *D*, Teeth in occlusion after treatment. *E*, Original appliance used. *F*, Obturator with clasps to engage buccal tubes on molar bands. *G*, Full mouth x-ray series. *H*, Occlusal x-ray reveals bilateral cleft involving both sides of the nasal fossae.

Case 13, a boy, aged 8, was born with a complete bilateral cleft lip and cleft of the hard and soft palates. His lip had been closed at an early age and the premaxilla pushed back. Subsequently, at the age of 7, the patient was

referred to Dr. Burdick. He successfully closed the soft palate, but an elliptical opening behind the premaxilla has not yet been repaired (Fig. 11 *A* and *B*). The premaxilla was movable. In it were the two central incisors in an almost horizontal position with the incisal edges directed lingually. There was a carious right lateral incisor in the line of cleft unsupported by alveolar bone, while the left lateral incisor was absent (Fig. 11 *C*). The mandibular right second deciduous molar was abscessed and accordingly was removed (Fig. 11 *G*). The occlusion appeared to be slightly mesial to normal.

A roentgenograph of the profile of the skull was negative (Fig. 11 *I*). Roentgenographs of the wrist and ankle revealed normal osteogenetic development (Fig. 11 *J* and *K*).

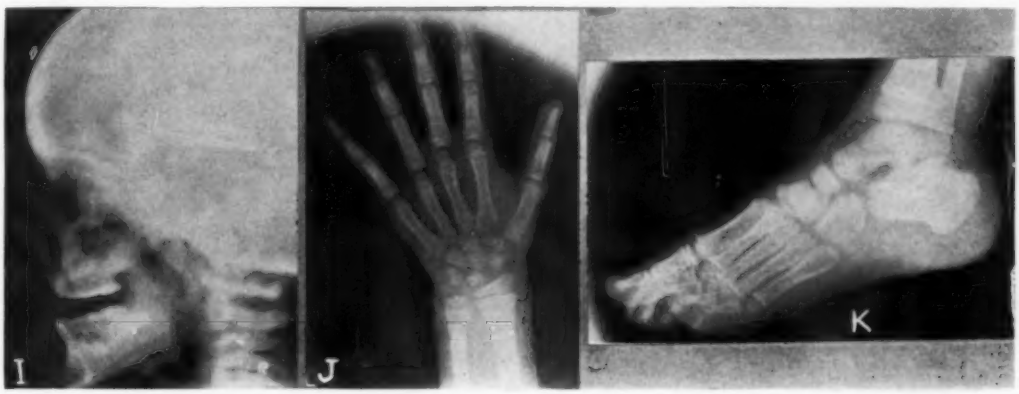

Fig. 11.—*I*, Profile view of skull. *J*, X-ray of wrist reveals normal osteogenetic development. *K*, X-ray of ankle reveals normal osteogenetic development. There is no evidence of ossification of epiphyseal development of os calcis.

A combined obturator and appliance was constructed with arms extended forward to engage the banded maxillary central incisors. The appliance was attached in the usual manner to the maxillary molar bands which had buccal tubes into which fitted the labial appliance (Fig. 11*E*).

On the mandible, the molars were banded for anchorage and a lingual appliance was constructed and inserted.

The maxillary incisors were moved downward and forward and are now in the normal relationship with their mandibular antagonists (Fig. 11*D*). Another obturator was constructed with finger springs engaging the maxillary central incisors (Fig. 11 *F*). Clasps were made to engage gingivally to the buccal tubes and thus did not interfere with the labial appliance.

Repair of the double or bilateral cleft of the lip, as performed by Dr. Burdick, is now done in two stages. First one side of the lip is united and at the next operation the other side without fracturing the vomer. Following this procedure the vermilion portion of the prolabium becomes continuous with the vermilion borders of the adjacent lip. A full and well-functioning lip is formed, permitting a normal mouth opening. However, in the case to be described, since the lip did not exert much pressure, the premaxilla remained protrusive and required orthodontic aid to reduce it.

Case 14, a negro boy, aged 3, was one of a pair of twins. He was born with a complete double cleft of the lip and cleft of the hard and soft palates (Fig.

12*A*), while his twin brother was normal. Only one placenta for the twins was reported present at birth. He presented a premaxilla far in advance of the tip of his nose (Fig. 12 *B* and *C*), an unusual situation even for a negro child.

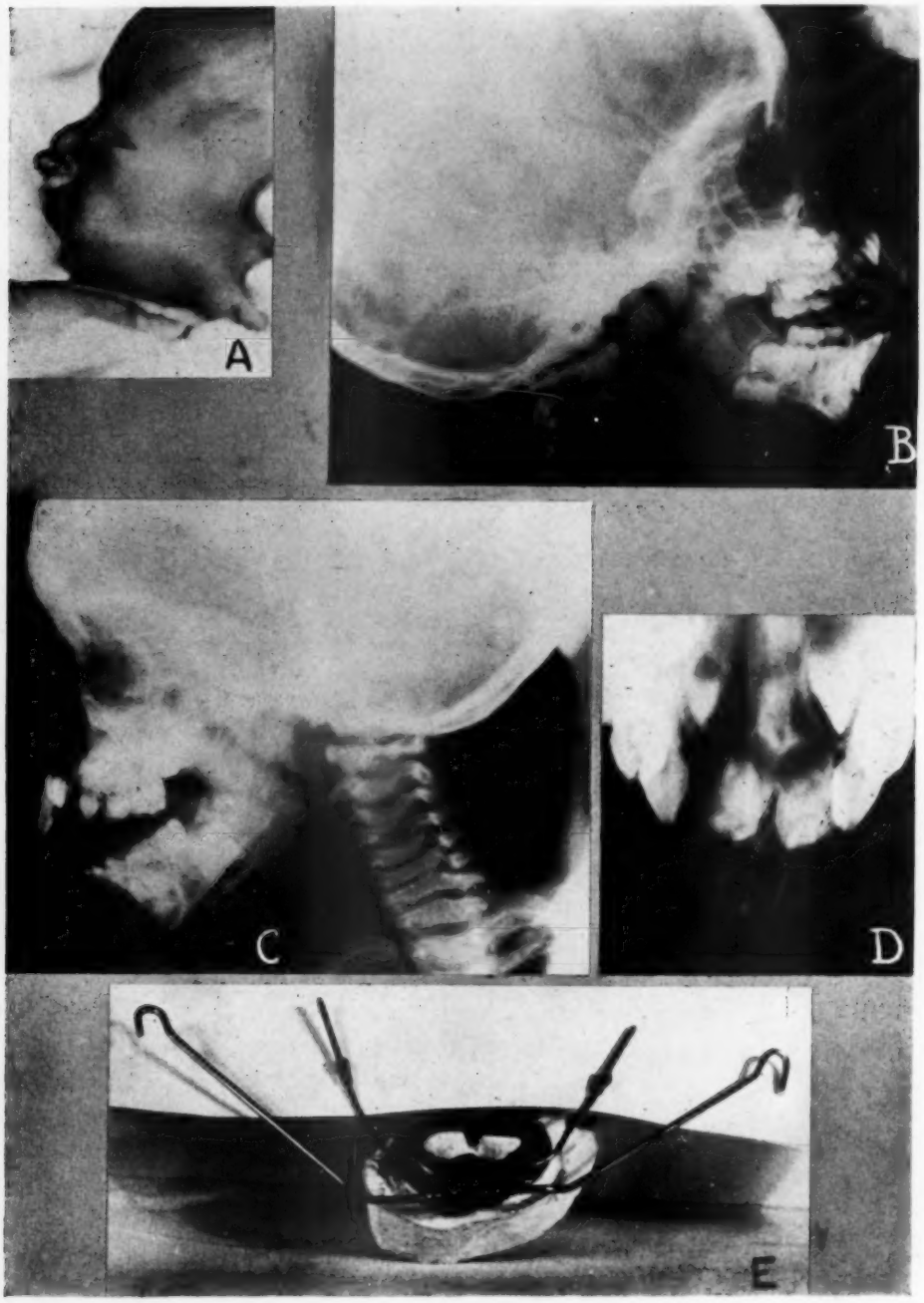

Fig. 12.—*A*, Profile of colored baby with bilateral cleft. (Courtesy of Carl G. Burdick, M.D.) *B*, Left lateral profile x-ray. *C*, Right lateral profile x-ray. *D*, Occlusal film. Permanent maxillary central incisor appears to be hypoplastic. There is no evidence of permanent lateral incisors. *E*, Appliance with vulcanite saddle and labial bitlike extension for extraoral elastics.

The lip was closed in two stages. The soft palate was successfully united as well as the hard palate behind the os inciveum. However, the problem of

anchorage in a child so young required grave consideration. It was imperative to bear in mind that the child's teeth were of the deciduous dentition (Fig. 12*D*).

The appliance consisted of a labial appliance imbedded in a splint-like saddle, molar bands, a bitlike extension, and a plaster head cap. The labial appliance had an encircling wire which fitted over the premaxilla and served as a base for holding the splint-like vulcanite saddle lined with velum rubber. From the sides of the saddle two wire arms extended backward and fitted into the split buccal tubes of the molar bands. From the labial of the saddle there extended a large horizontal tube which had been soldered to the embedded labial arch. Through the tube was fitted, passed, shaped, and locked a bitlike wire projection ending in hooks for extraoral elastics. A plaster head cap was made

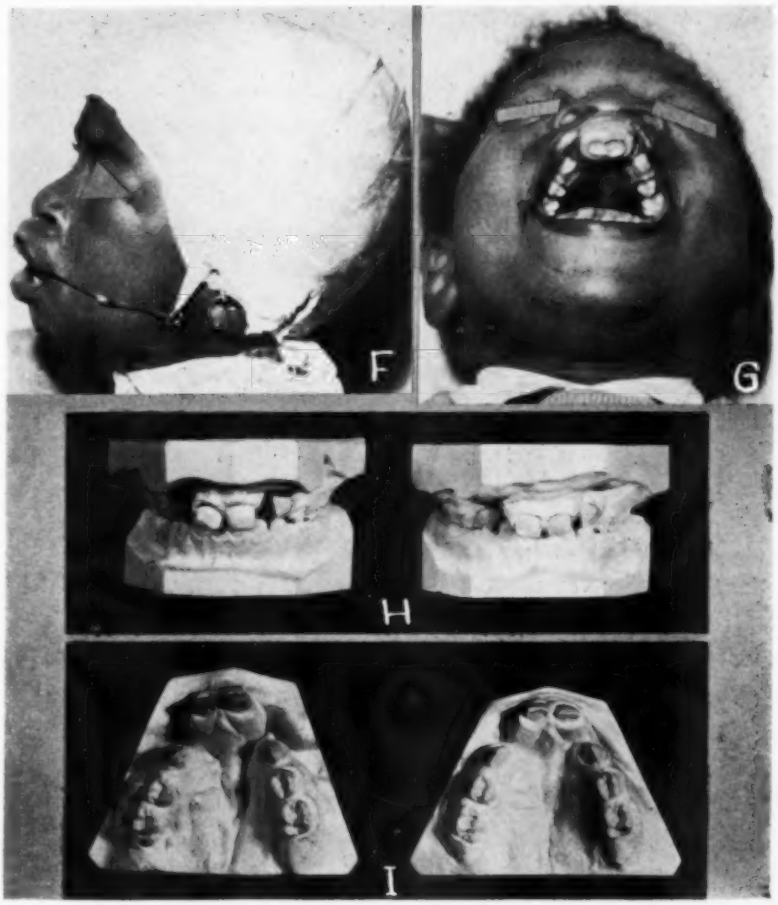

Fig. 12.—*F*, Profile view with appliance, plaster head cap and extraoral elastics in position. *G*, Sectional retainer with buccal springs for minor adjustments. *H*, Views of models before and after treatment. *I*, Occlusal view of palate before and after treatment.

with a wire embedded in it and hooks exposed in front of the right and left tragii to correspond to the level of the anterior hooks from the bitlike labial extensions. These received the extraoral elastics for traction (Fig. 12 *E* and *F*). After the protrusion was reduced to nearly normal for a negro child, the plaster head cap and appliances were removed.

A second appliance was made. This consisted of crib clasps on the first deciduous molars, re-enforced with a full vulcanite palate for anchorage. From

the crib clasps spring extensions were carried forward and embedded in a separate splint-like saddle on the premaxilla which held this section in place and provided a horizontal split-palate effect thus enabling us to use the buccal spring for minor pressure adjustments and also as a retainer (Fig. 12*G*).

Considerable progress can be reported as the premaxilla is now in a favorable position (Fig. 12 *H* and *I*).

SPEECH IN CLEFT PALATE AND PERFORATIONS

While orthodontic treatment is necessary to supplement plastic repair of cleft palate in order to improve the masticatory function of the teeth, for esthetic reasons and to aid in speech, yet it is obvious that unless the patient learns to talk correctly, he will be severely handicapped in his adjustment to social and economic pursuits.

Cleft palate speech is a defect in the utterance of letter sounds due to an anatomically deficient palate and physiologic disturbances in speech impressions. The mechanism of speech requires an anatomically restored palate which would separate the nasal from the oral cavity. It requires a flexible soft palate which, as word sounds demand, would partially or completely close off the nasopharynx. Despite the attempts before operation of related or associated muscles to compensate for the inability of the single muscles to do this, thereby minimizing the speech defect, their efforts are futile.

Following plastic operations the united and repaired muscles must accommodate themselves to proper functional speech movements. The cleft palate patient must overcome his false mental impressions of words, which necessitates his unlearning these wrong impressions. In their places he must learn new but correct sound images.

Accordingly, speech training is strongly recommended so that the cleft palate patient may be trained to use his muscles and be taught how to articulate sounds and enunciate words properly. It is advisable to refer the cleft palate patient to a specially qualified speech teacher for speech re-education.

In acquired palatal perforations (with few exceptions where there may be adhesions of the soft palate to the posterior pharyngeal wall, or in neurologic disturbances as in syphilis, etc.) normal speech will usually be restored without speech training after the patient has learned to use an artificial restoration.

SUMMARY

1. Congenital cleft lip and cleft of the hard and soft palates are due to failure of union of the primordoria about the stomodeum during embryologic development. The nonunion continues throughout the fetal period and is present as a cleft at birth.

2. The etiology of failure of union in embryo of cleft palate is not known, but may be attributed primarily to heredity or possibly to disturbances during embryologic life.

3. Perforations or openings simulating congenital clefts may be due to injury or disease, but are all acquired later in life, the patient having been born with a normal lip or palate.

4. Operations for repair of cleft lip (harelip) and cleft palate should be supplemented with orthodontic treatment for better masticatory function and improved esthetic appearance and also combined with an obturator, where indicated, to facilitate speech correction.

5. Speech training by a competent teacher is urgently recommended to overcome cleft palate speech and to learn proper articulation and enunciation.

6. In acquired perforations, normal speech can usually be restored without speech training after the patient has learned to use the artificial restoration.

The writer desires to express his deep gratitude to Carl G. Burdick, M.D., Director of the Fourth Surgical Division of Bellevue Hospital and Chief of General Surgical Service at the Hospital for the Ruptured and Crippled, New York, for the encouragement and stimulating cooperation accorded him throughout the course of this work. Dr. Burdick generously provided many of the illustrations, case histories, and indeed most of the actual cases upon which this study is based. His keen interest in cleft palate reconstructions has extended beyond the field of surgery into that of orthodontics and has resulted in the extension of orthodontic follow-up both in the Hospital for the Ruptured and Crippled and in the Bellevue Hospital, New York. I also wish to thank Joseph D. Eby, D.D.S. of New York, my former teacher of orthodontics, for his inspirational guidance in the field of orthodontics and for his many valuable suggestions, and Leo Winter, M.D., D.D.S., Professor of Oral Surgery of New York University College of Dentistry and Chief of the Dental Department of Bellevue Hospital, New York, for his fine clinical cooperation.

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57 WEST FIFTY-SEVENTH STREET

THE BASIS FOR A MODERN CONCEPT OF ORTHODONTICS

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ORTHODONTICS, like all sciences, had first to be conceived, to pass through many stages in its evolution and finally develop into a recognized scientific profession. The historical account of this development has been splendidly presented in two interesting volumes by Dr. B. W. Weinberger. These books record the efforts of the early workers in this field, the subsequent improvements of later generations, leading up to the modern scientific concept of orthodontics.

The present era of orthodontics has received its impetus in the last quarter of a century and has not yet reached the full measure of its development. Credit for this rapid progress in the past few decades must be given to the ever increasing standards of education and the scientific research which it encourages. However, one cannot overlook the noble efforts of our pioneers and particularly the men who had the imagination to conceive new theories, the ability and fortitude to try them out, and the keen minds to observe and record the results of their experiments. We must pay tribute to the father of American orthodontics, Dr. Edward H. Angle, and express our sincere gratitude for the basic truths which he propounded, for the mechanical principles which he set forth, for his systemization of analysis for treatment, and last but by no means least, for inspiring research and study.

Today, an orthodontist must be more than a skilled artisan who can apply engineering principles in his practice. He must have a knowledge of a great many of the associated sciences, such as genetics, heredity, embryology, histology, pathology, anatomy, physiology, endocrinology, nutrition, allergies, metallurgy, roentgenology, and even psychology. These and others are the essential requirements for the orthodontic foundation upon which our scientific profession must progress. So broad is its scope that one must ask, "How far does it extend and where is its source?" We might start by accepting the theologic concept of Genesis, namely, "In the beginning God created the heaven and the earth . . . . And God created man . . . ." From this point the scientist is more familiar with the way; according to the findings and studies of the archaeologists and paleontologists, there is a definite plan of human form and structure that has been in existence for many centuries.

As expressed by Weismann, "The body protoplasm, or soma, and the reproductive protoplasm differ fundamentally. The germinal material is a legacy that has existed since the beginning of life, from which representative portions are passed on intact from one generation to the next. Around this germ-plasm there develops in each successive generation a short-lived body, or soma which serves as a vehicle for insuring its transmission and perpetuation."

Evolutionary changes brought about by the necessity for adaptation to new and changing environments have influenced human characteristics, the basis

Submitted as partial requirement for a certificate of the American Board of Orthodontics.

for racial differences. Geneticists have shown that there are recessive and predominating characteristics in man that are transmitted through the genes in chromosome division; for example color, stature, and type have long been recognized. Tissue tolerance and susceptibility and other familial diatheses are some of the newer thoughts concerning heredity.

The theory of unit dominants, such as endognathism and exognathism, and the small teeth of the mother and the large jaws of the father, is still debatable. Some eminent students of the subject claim that the evidence of skeletal material seems to show that there is a harmonious blending of the genetic characteristics of the parents. However, the work of Dr. LeRoy Johnson, in his study of the hybridization of dogs, refutes their contention. This is important when we consider the number of mixed marriages in our great American melting pot. The family background of our patients might account for many of the anomalies which are not amenable to treatment. Congenital absence of teeth, agenesia, or the congenital absence of portions of the body, have been traced through several generations of families showing the hereditary element involved. Abnormalities of the congenital type may also be due to maternal nutritional disturbances, endocrine imbalance, diseases such as syphilis, and other pathologic interferences. Even variations in growth of the embryonic tissues may account for interferences in the union of parts such as in cleft palate.

As we have touched upon the prenatal factors which influence the individual as a whole, it would seem logical to consider some of the postnatal factors which are significant to the general well-being of our patients. Studies on nutrition and metabolism reveal that this phase of life has been underestimated and a wide field for research has been opened. The early enthusiasts were inclined to believe in the theory that "As a man eateth, so is he." Today, the hereditary factors are considered first in importance and the nutritional factors second, in the process of growth and development. This is obvious, for food cannot replace the aberrations discovered at birth. A truism for nutrition is that it is necessary to have a diet that contains at least the minimal amount of all ingredients that are a prerequisite for normal growth and development. The problem of mineralization is particularly important to the orthodontist for, as Dr. Todd states, "One must realize that in mineralization one is not studying the construction parts of a permanent substance but rather the fabrication for a supporting framework, the pattern of which may indeed be permanent but the constituent parts of which are constantly undergoing change and reconstruction to meet the needs of the moment in alignment and activity.

Inasmuch as a calcium-poor condition of the body may go unrecognized for an indefinite period, many children are growing up with poor bone structure, which of course makes them poor orthodontic risks, for they will probably not realize their full potentialities for growth and development. Osteomalacia may be determined by roentgenologic study of the long bones, revealing a diminution in the number of trabeculae and a marked increase in the size of the cancellations. Important as is the intake of sufficient food elements, vitamins, minerals, etc., their metabolism can only be effective when there is a normal physiologic function of the organic processes of the body. Here again, we must look to our allied professions for assistance.

The endocrine glands are very important factors in the general economy for growth and development. Although these organs have only recently received the attention of research, a great many facts have been discovered. The thyroid and pituitary glands are particularly important to the field of orthodontics since they are known to have significant control over growth and development. The thyroid gland is said to influence general growth while the pituitary gland governs maturation. Most workers feel that there is a synchronization of the two. The parathyroids are of especial interest to the orthodontist as they affect the calcium metabolism. A hyperthyroidism may result in an osteoporosis which cannot be prevented or cured by dietary or medicinal administration but calls for surgical intervention. Other glands are known and of course are important, but have no great influence upon our studies.

The above treatise might be considered an elementary introduction to our subject, but it is believed that orthodontics of the future must depend upon science rather than upon mechanics alone and the frame of mind which mere mechanics engender. It is a foregone conclusion that a knowledge of the associated sciences as they affect the body as a whole is important, but the application of these basic sciences to the immediate field of our endeavor is essential. The growth and development of the head, but more particularly the dentition and its supporting structures, together with the correlated tissues and parts which make up the face and oral cavity, must comprise our major studies.

Dr. Strang, in his comments on the preconceived plan of occlusion, said, "The organ of mastication is a very important portion of the body and unquestionably its position in relation to the head and body anatomy is carefully and definitely located in this preconceived vision. Hence there is a special position in the 'space' of every individual that the denture is to occupy and nature evolves the component parts of this organ to conform to the size, location, and type therein expressed."

The biologic interpretation of the factors which determine this course are divided into intrinsic and extrinsic causes. According to Dr. McCoy, "The intrinsic factors or causes are those which are dependent upon or incident to the protoplasmic structure of the germ stuff and are largely the guiding and determining factors in development, while the extrinsic factors or causes are largely such as supply the stimulus and energy for development. In studying the development of individual organs or groups of organs it is but natural and logical to consider their developmental history as being influenced by two distinct periods, the first of which is concerned with their formation prior to the establishment of function, and the other the period of differentiation and growth which follows and is dependent upon function. It is this latter period which brings to pass the finer functional harmonies of the organism."

The story of the embryologic processes and growth from conception to birth has been pretty well unfolded by authoritative research. The growth of the masticatory apparatus is a complex study of odontology and the investing osteology, with the latter being influenced greatly by the former during eruption and function.

"The growth of the different parts and structures is not uniform in all directions," continues Dr. McCoy. "All manner of structural differences

come into play, setting up unequal resistances. The sources of growth are not uniformly distributed; one tissue may show a tendency to increase and another does not; the bones, the intervening cartilages, and the surrounding muscle may show different rates of increment. Under normal conditions these differences in rates of growth are harmonized by the specific function of mastication. In the absence of this specific function the definite forming influence of this part of the organism is missing, and a typical form, i.e., form without a typical character appears."

This, we have a great variety of facial patterns possible, or as expressed by Dr. Todd, "Faces differ and most of us are content to assume that the differences are largely due to the hereditary tendencies implicit in the genes. But as the face, like the rest of the growth pattern which in the course of its progress may be expedited, interrupted, retarded, warped, or inhibited by misadventure of health and by vagaries in the interplay of those organically organized influences by which the pattern is promoted, it is evident that environment, external, and more particularly internal, must contribute in no small manner to the final result."

It was from the following conclusions of Dr. Dudley J. Morton that Dr. Alfred P. Rogers claims to have received much encouragement in his studies of "functional efficiency or coordination in muscular function." "Structural alterations are not the result of any variation in mechanical laws as they affect the development of bone, but are the natural sequence of a disturbance in the normal function in its relationship to the various tissues, whereby the mechanical laws are caused to work habitually in an abnormal or exceptional manner. The laws are immutable; it is the manner of use that changes, and structural modifications follow in accordance with the changes in function. Hence the logical interpretation is that an altered employment of mechanical forces by a structure inevitably causes the original structure to be molded by those forces so that they may work more advantageously in the newly adopted manner, and by the same process, wasting follows non-use. The actual alterations of bone structure are accomplished by two very simple and well-known processes, no matter if the alterations comprise marked changes of the entire structure or merely slight, localized rearrangement of the internal structure; those processes are (1) increased growth, physiologic hypertrophy, and (2) absorption, physiologic atrophy, or diminished normal growth as the case may be."

Dr. Strang supports this theory with the statement, "Bony deformities are but the external manifestations or surface expression of correct mechanical adjustment of the osseous tissues in malformed or incorrectly associated parts."

It is evident, from these statements, that the organic and metabolic processes of the individual are second in importance in the process of growth and development while the hereditary influences take first place. The third position in this scheme of life processes is given to function. Although each is significant, disturbances of the number two and three factors are amenable to treatment if they are recognized in their incipient stages. The responsibility for the number two part must rest primarily upon the physician and the allied sciences. However, the orthodontist should be able to recognize gross symptoms

and request consultation, and even demand it. The third part is definitely an orthodontic responsibility and also that of the entire dental profession. The balance and rhythm of function in a normal health picture are the determining factors in the ultimate success of an individual in obtaining the maximum potentialities of growth and development, which, in turn, make for symmetry and harmony in facial form.

To facilitate the study of the changes in the human face brought about by development, Dr. Hellman has recognized five stages in the development of human dentition and two stages of retrogression:

"1. The period of early infancy, before the completion of the deciduous dentition.
2. The period of late infancy, at the completion of the deciduous dentition.
3. The period of childhood, when the first permanent molars are erupting, or have taken their places, in addition to which some or all of the deciduous incisors have been lost and are replaced by their permanent successors.
4. The period of pubescence, when the second permanent molars are erupting or have taken their positions, in addition to which some or all of the deciduous canines and molars are being succeeded.
5. The period of adulthood, when the third molars are erupting or have taken their places.

The retrograde stages are:

1. The period of old age, when occlusal surfaces are worn off to the extent of obliterating the pattern of the grooves.
2. Senility, when at least one-half of the crowns are worn off, in addition to which some, most, or all of the teeth have been lost."

This study in the evolution of the normal denture and its concomitant effect on the development of the human face, should be an important, if not a fundamental prerequisite of every dentist and especially, the orthodontist. Only by understanding rates of growth and maturation of both the teeth and the bony structures in the normal, can one recognize the abnormal, and thus evaluate diagnostic findings for the purpose of determining the plausible period for changing the environmental influences or directing their course of influence.

This brings us to the question of orthodontic aims or objective. This might be answered in a variety of ways but the definition of orthodontics by Dr. James D. McCoy coincides with our thoughts. He writes in his text, "Orthodontics is a study of dental and oral development; it seeks to determine the factors which control growth processes to the end that a normal functional and anatomic relationship of these parts may be realized, and aims to learn the influences necessary to maintain such conditions when once established."

The aims of orthodontics were made to sound quite simple when Dr. Hellman said, "The aim of orthodontics is to establish normal occlusion in dentition with malocclusion." At first blush, this would seem to be a problem of mechanical principles with the individual dental units involved. The problem becomes more complex when we realize that we can no longer accept the old concept of normal occlusion which merely considered the interdigitation or meshing of occlusal cusps in their accepted standard relationship when the jaws are

closed in the centric position. This does not complete the picture of the scientific concept of normal occlusion. Dr. Strang tells the story in a conclusive manner, "Normal occlusion is that structural composite consisting fundamentally of the teeth and jaws, and characterized by a normal relationship of the so-called occlusal inclined planes of the teeth that are individually and collectively located in architectural harmony with cranial anatomy, exhibit correct proximal contacting and axial positioning, and have associated with them a normal growth, development, location, and correlation of all environmental tissues and parts."

Since the normal includes a certain range of deviation, normality of facial forms becomes a personal equation, and each orthodontist adopts his own standard, based upon his personal experience. This fact was appreciated by Dr. Hellman when he said, "I am still bothered by the lack of a proper answer to each of the following questions: First, what constitutes a 'normal' face? Secondly, what constitutes an abnormal face? And thirdly, what are the differences which distinguish the abnormal from the normal face, about which, all orthodontists are so much concerned?"

In his effort to find an answer to these questions, Dr. Hellman adopted a new approach to the problem. By using anthropometric measurements applied to the living facial features, he "tabulated the features of a series of adult males with normal occlusion, showing average and standard deviations of their dimensions, and the polygon derived by joining these points is used as the normal standard." Even by this scientific approach for a "yardstick," Dr. Hellman found that the dimensions of the facial features studied in this group with normal occlusion, are not all normal. The familial or hereditary characteristics still had a dominating influence. He concludes with this statement, "It is thus clear that the use of the described 'standard' provides a measure which greatly reduces the confusing intricacies of facial variation and simplifies the practical problem of appraising faces for orthodontic needs."

This study brings us much closer to the modern conception of orthodontics and clarifies efforts at classification, based on normal occlusion, on the one hand, and normal facial growth and development, on the other. But, in grouping cases for treatment, there must be a further subdivision, for, according to Dr. Strang, "Classification is a process of analyzing cases of malocclusion for the purpose of segregating them into a small number of groups, which groups are characterized by certain specific and fundamental variations from normal occlusion of the teeth, which variations become influential and deciding factors in providing the fundamental data for the preparation of a systematic and correlated plan of treatment."

The need for a better system of classification is emphasized by Dr. George M. Anderson in this comment, "Mechanical principles applied in treatment of malocclusion of the teeth are rational enough, but the same cannot be said for our methods of diagnosis and classification." Since no one plan has been found to be completely satisfactory, perhaps the adoption of the classification of Dr. Angle or of Dr. Lischer, in conjunction with Dr. Hellman's "standard," would give us a uniform system for grouping our cases.

It is not within the scope of this paper to discuss treatment, and the mechanics involved, but rather to consider the fundamental prerequisites to it. The

vast amount of research in recent years based upon the longitudinal method, or long-term studies of growth and development, plus the newer studies in embryology and histology, have done much to change the orthodontic concept of the past. Today, the limitation of mechanics is more keenly appreciated by the knowledge of these basic principles and a recognition of the fact that growth and maturation limit the possibilities of orthodontic accomplishment.

It is sincerely hoped that this paper might divert some purely mechanistic minds to the broader scope of our profession, the fundamental background for our existence, greater service to humanity.

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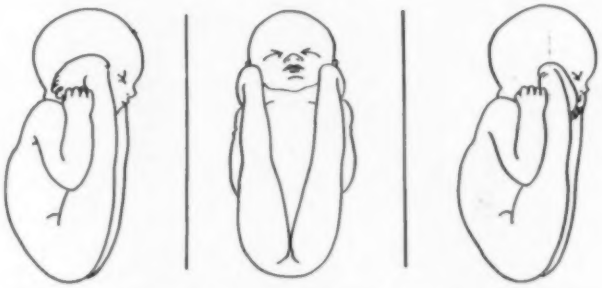
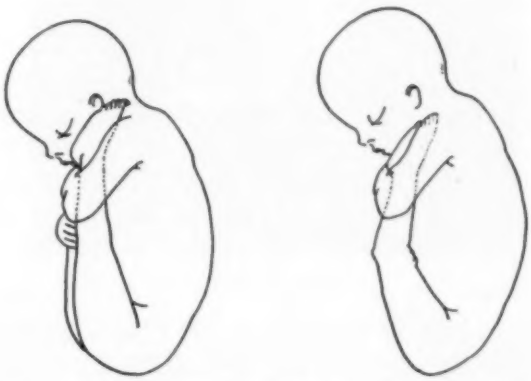
A Study of the Relationship Between Fetal Position and Certain Congenital Deformities: Charles C. Chapple, M.D., Philadelphia, Pa., and Douglas T. Davidson, M.D., Wilmington, Del. *J. Pediatrics* **18**: 483, April, 1941.

Uterine pressure occupies a prominent place in medical literature among the suggested causes of various congenital deformities. This paper has been written in an attempt to further the explanation of the mechanism involved in



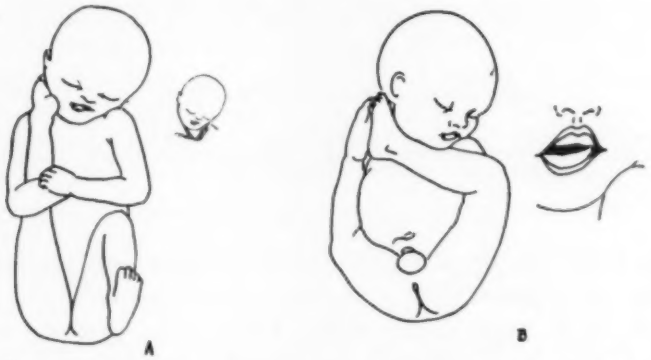
"Positions of comfort." (From Holt and McIntosh, D. Appleton-Century Co., p. 88.)



"Positions of comfort." These sketches represent the steps in the production of hyperextension of the knee. (From Holt and McIntosh, D. Appleton-Century Co., p. 88.)

the causation of such deformities and to suggest a simple method for the determination of obscure deformities. The early detection of such deformities has prognostic significance and may have preventive value.

The authors began by determining the "position of comfort" of all newborn infants and soon learned that the positions occasionally included abnormal postures with no resulting deformity or with minor ones but that reconstruction of the position in infants with one or with no obvious deformity frequently led to the finding of unsuspected abnormalities.



"Positions of comfort" demonstrating the production of deviation of the jaw. The infant in *A* had a torticollis and a mild talipes varus. The infant in *B* had limitation of flexion in the left knee and a shallow acetabulum on that side. Small sketches show details of pressure mechanism on the chin. (From Holt and McIntosh, D. Appleton-Century Co., p. 88.)

"Position of comfort."

Several infants with signs of pressure on their mouths and jaws showed by their "positions of comfort" that one or both legs had been extended across the body, bringing a foot to one side of the head, and thereby forcing the head against the opposite shoulder. In this group is one case of torticollis caused in this manner, but most of the group simply have a deviation of the jaw. The authors have observed many of these cases and many more are reported in the literature.

The Selection of Cases for Space Maintainers: By Joseph T. Cohen, D.D.S., *North-West Dentistry* **20**: 75, April, 1941.

The average individual relies on deciduous teeth to masticate his food properly for approximately one-fifth of his entire lifetime. These teeth function at a period in the child's life when growth and development are of the *utmost importance* and consequently they should be carefully guarded. The deciduous teeth should remain in the child's mouth until the time arrives for the succeeding permanent teeth to replace them. The reasons advanced for this are: (1) the space will be retained so that the permanent teeth may come into the arch in normal occlusion; (2) the retention of these deciduous teeth for the proper length of time will assist in proper mastication and will prevent the elongation of opposing teeth.

Premature loss of deciduous teeth occurs frequently. We have all observed children's mouths in which one or more deciduous teeth have been prematurely lost and in which the spaces closed and resulted in a malocclusion of the permanent teeth. On the other hand, many cases, in which deciduous teeth are prematurely lost show no apparent effect on the growth and development of the arches, or on the occlusion of the permanent teeth. The problem then is to decide when and where space maintainers in the deciduous arches may be used to advantage.

This project was started in 1926 at the Institute of Child Welfare, University of Minnesota, and has been carried on without interruption up to the present date. Impressions were taken of the mouths of 156 preschool children, and this same procedure was repeated annually on the same children. In this group, twenty-one series of casts, with an average of approximately nine casts for each series, disclosed the premature loss of deciduous molars. There was a total of thirty-three deciduous molars lost some time between the ages of 3 years, 10 months and 8 years, 9 months. The average was 6 years, 9 months. Fifteen of the teeth lost were second deciduous molars and eighteen were first deciduous molars.

The permanent teeth occupy almost 1 mm. less in the upper arch and 2 mm. less in the lower arch than do the deciduous cuspids and molars. In other words, if the deciduous teeth are prematurely lost and the space closes only one or two millimeters, nature provides that there shall be sufficient space to accommodate the succeeding permanent teeth. Should this space close to a greater degree and remain so, the permanent succeeding teeth might come into the arch malposed. This is the reason for the use of space maintainers.

Of the eighteen first deciduous molars lost at the various ages from 3 years and 10 months, to 8 years and 2 months, only one of the spaces sufficiently closed to cause the succeeding permanent tooth to erupt in an abnormal position. In other words, 94 per cent developed quite normally in spite of the premature loss of the first deciduous molar. The age at which the tooth was lost appeared to have no bearing on the closure of the space.

The loss of the second deciduous molar, in nine out of fifteen, or only 60 per cent of the mouths where the tooth was prematurely lost, in children ranging in age from 3 years and 10 months, to 8 years and 9 months, showed no ill

effect with regard to arch development. Forty per cent of the mouths studied showed closure of spaces. Apparently, the age at which the deciduous tooth is lost has little bearing upon whether or not the space will be retained or lost. The second deciduous molar in the mandible was affected with caries in 70 per cent of all children between 3 and 4 years of age.

Space maintainers are valuable in maintaining space and restoring function. There are some problems, however, involved in their construction. First, there is the expense; second, there are the difficulties encountered in properly making and cementing them to place, and third, there is the problem of retention in the mouth.

If the restoration of function is an important factor, as it might be in certain cases, then a functional maintainer should be placed in the mouth to replace the lost tooth. Most maintainers, however, do not attempt to restore function. Therefore, in those cases where function is not a consideration, the only reason for the restoration is to maintain space.

Our findings disclosed that the premature loss of the first deciduous molar did not result in a collapse of the space, so space maintainers as such, are seldom indicated in these cases. The loss of the second deciduous molar presents a different picture. The space created by its loss should be carefully observed and a maintainer placed in the arch at the first indication that space is materially closing.

If the second deciduous molar is lost before the first permanent molar erupts, the problem is accompanied with serious difficulties. The only type of space maintainer which might be useful in these cases is a type of maintainer introduced by Willet some time ago. It usually requires some preliminary surgery, and considerable skill to construct and properly cement into place.

Permanent teeth frequently erupt in a crowded condition in the arch despite the fact that no deciduous teeth were prematurely extracted. There is a natural decrease in arch dimensions in the cuspid and premolar segment of the arch, of from 1 to 2 mm. to provide for some loss of space in this area. The premature loss of the second deciduous molar frequently results in an extensive closing of the space, forcing the succeeding permanent teeth to take an abnormal position in the arch. The premature loss of the first deciduous molar seldom results in the closing of the space and the crowding of its succeeding tooth.

Editorial

Laboratories Again

The Illinois Supreme Court has recently upheld the constitutionality of the Illinois Dental Practice Act which prohibits dental laboratories from advertising the sale of dentures directly to the public, for reasons that every dentist knows only too well.

In its decision the court upheld the right of the legislature to regulate the practice because of the intimate relation to public health and welfare, after affirming its previous opinion authorizing the restriction of advertising by dentists. The court stated, "If the restriction of which the appellants complain were removed, it would permit licensed dentists receiving patients referred to them by dental laboratories to do indirectly what other provisions of the act prohibit them from doing directly."

From the standpoint of the dental profession and the public, another important step in the right direction would be a similar decision handed down that would prohibit dental laboratories from diagnosing and directing treatment of malocclusion. If the dentist is competent to treat malocclusion, there is no reason why he should ask the counsel of a dental laboratory to direct his treatment. If, on the other hand, he is incompetent, it is not the service of a laboratory that he needs to direct his treatment. It is either more units added to his dental education, or the assistance and cooperation of a well-trained orthodontist. One might dispute this by saying that every dentist holds a diploma from a recognized dental school, and in addition holds a license from his State Board of Dental Examiners that permits him to treat malocclusion. So, what do you mean, more units of education?

The answer to that probably would be that, if the dental schools and state boards are granting diplomas and licenses to dentists to practice the treatment of malocclusion, and if such graduates admit their own limitations in practice to an extent that they must call in a mechanical laboratory to diagnose and treat their cases, this is ample evidence that there is something wrong some place along the line of dental education that needs much in the nature of a quick, practical remedy and less in the way of pedagogic "sky writing" in looking for the remedy of the situation.

The dental profession leaning upon the laboratory as its orthodontic mystic director creates a situation much like that of the graduate physician who is confronted with a mutilated leg that requires quick amputation and who sends in to the manufacturer of cork legs asking for a new leg and instructions as to how to proceed. In any event here is a situation that if not soon remedied by the dental profession and the schools themselves should be corrected by the courts for the benefit of the public at large. In the words of George Creel "It is to laugh" that such a paradoxical situation can exist in a profession devoted to the healing art. Something should be done by the profession itself before this "blind spot" of dental practice attracts wider attention.

H. C. P.

News and Notes

Southern Society of Orthodontists

The next meeting of the Southern Society of Orthodontists will be held in Raleigh, N. C., Sept. 29 and 30, 1941.

Great Lakes Society of Orthodontists

The Great Lakes Society of Orthodontists will meet in Ann Arbor, Mich., Nov. 3 and 4, 1941.

Midcontinent Dental Congress

The Midcontinent Dental Congress will meet in St. Louis, Mo., Nov. 17, 18, and 19, 1941.

Third Medico-Dental Convention

The Third Mexican Medico-Dental Convention was held in Mexico City, June 23 to 28, 1941, at the School of Dentistry of the National University, with General Manuel Avila Camacho, President of Mexico, as honorary president.

Officers of the Mexican Orthodontic Association are the following: Honorary President, Dr. Spencer R. Atkinson, Pasadena, Cal. *Organizing Committee:* President, Dr. Carlos M. Paz. Secretary, Dr. Samuel Fastlicht. Treasurer, Dr. Guillermo S. Gamboa. Clinics, Dr. Luciano Alexanderson. Projections and Films, Dr. Rutilo S. Blanco. Industrial and Commercial Exposition, Dr. Guillermo S. Gamboa. Social Activities, Dr. Luis Farril. Publicity, Dr. Miguel Diaz Mercado. *Honorary Vice-Presidents:* The Honorable Josephus Daniels, Ambassador of the United States in Mexico. Lic. Ezequiel Padilla, Secretary of the Foreign Office. Dr. Gustavo Baz, Secretary of the Public Assistance. Dr. Victor Fernandez Manero, Chief of the Health Department. Lic. Javier Rojo Gomez, Major of the City Hall. Lic. Mario de la Cueva, Rector of the National University of Mexico. Lic. Rodolfo Delgado, Rector of the University of Guadalajara. Dr. Jose Aguilar Alvarez, Dean of the School of Medicine of the National University of Mexico. Dr. Aurelio Galindo, Dean of the School of Dentistry of the National University of Mexico. Dr. Ramon Cordova, Dean of the School of Dentistry of the University of Guadalajara. Dr. Mattan B. Van Etten, President of the American Medical Association (New York). Dr. Oren Oliver, President-Elect of the American Dental Association (Nashville, Tenn.). Dr. Claude R. Wood, President of the American Association of Orthodontists (Knoxville, Tenn.). Dr. Jose J. Rojo, President of the Mexican Dental Federation.

Dr. Claude R. Wood and Dr. Oren Oliver were elected Honorary Members of the Mexican Orthodontic Association and received diplomas. In a solemn session Dr. Spencer R. Atkinson, as Honorary President of the Mexican Orthodontic Association, received an engraved silver plate representing the Universities of Mexico and Southern California. He also received a diploma.

Dr. Oren Oliver, Dr. Claude R. Wood, Dr. Charles W. Lincoln, Dr. Don J. Aubertine, and Dr. Juan Gustavo Mathe were elected Honorary Members of the Mexican Dental Federation and received diplomas.

A letter which Dr. Aubertine brought from Dr. Robinson in which he extends an invitation, from the American Dental Association, to attend the Convention in Houston, Texas, was read.

Dr. Oren Oliver, elected President of the American Dental Association, read a message.

The Honorable Josephus Daniels, Ambassador of the United States in Mexico, called the attention to the importance of the relationship between Mexico and the United States. The American Embassy offered a Tea.

The Department of Health offered a ball in the Hotel Reforma to honor the delegates.

The City Hall of Mexico offered a banquet in Xochimilco.

The Governor of Puebla also offered a dinner and delivered the key of his City to Dr. Spencer R. Atkinson, Honorary President of the Mexican Orthodontic Association.

Finally the Mexican Orthodontic Association gave a banquet in the famous "Jardin Borda" of Cuernavaca, as well as in the night club "El Patio."

Among the papers presented which are of interest to orthodontists and oral surgeons are the following:

Surgical Treatment of Periodontoclasia. Dr. Arturo I. Rosado.

A Health Program for the School Child. Dr. Ethel Fisher, Pasadena, Calif.

Contribution to the Study of the Treatment of Canals. Dr. Fernando Todd.

Cancer in the Oral Cavity, Dr. George S. Sharp, Pasadena, Calif.

Some Aspects of General Dental Hygiene, Dr. Félix Leyceguí.

The Mouth and Its Physician. Dr. Alfonso G. Alarcón.

Focal Dental Infection and Cardiac Rheumatism. Dr. Ignacio Chávez.

Orthodontics, Diagnosis, Treatment and Retention. Dr. Spencer R. Atkinson, Pasadena, Calif.

New Contributions to the Study of the Mottled Tooth in Mexico. Dr. Ramón Córdova.

Construction of the Labial Arches for Contraction and the Lingual Arch for Expansion. Dr. Matías Muraira.

Operative Procedures. Dr. E. M. Jones, Los Angeles, Calif.

New Concepts on the Physiopathology of Local Anodynes. Dr. Sergio Varela.

Endocrine Factors in Problems of Growth and Development. Dr. E. Kost Shelton, Westwood, Calif.

The Importance of Mineral Salts in the Diets of the Very Young and Adolescents. Dr. Francisco de P. Miranda.

Upper and Lower Impressions for Total Restorations. Dr. Sergio Guzman.

Interesting Phases of Oral Pathology and Diagnosis. Dr. Don J. Aubertine.

Experimental Demonstration of the Radiographic Distortion and the Image of the Included Teeth. Dr. Félix del Paso.

Orthodontics and Psychiatry. Dr. Maximiliano Weihman.

Labio-Lingual Technique and Guide Plane, Its Construction Step by Step in Motion Pictures. Claude R. Wood and Dr. Oren Oliver.

Note of Interest

Dr. J. S. Cunningham announces the removal of his office to 2418 Travis Street, Houston, Texas. Practice limited to orthodontics.

OFFICERS OF ORTHODONTIC SOCIETIES*

American Association of Orthodontists

President, Claude R. Wood _ _ _ _ _ _ _ _ 608 Medical Arts Bldg., Knoxville, Tenn.
Secretary-Treasurer, Max E. Ernst _ _ _ 1250 Lowry Medical Arts Bldg., St. Paul, Minn.
Public Relations Bureau Director, Dwight Anderson
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 292 Madison Ave., New York, N. Y.

Central Association of Orthodontists

President, Harold J. Noyes _ _ _ _ _ _ _ _ 55 E. Washington St., Chicago, Ill.
Secretary-Treasurer, L. B. Higley _ _ _ _ _ _ _ 705 Summit Ave., Iowa City, Iowa

Great Lakes Society of Orthodontists

President, Frank S. Cartwright _ _ _ _ _ _ _ Henry Ford Hospital, Detroit, Mich.
Secretary-Treasurer, Richard E. Barnes_____838 Keith Bldg., Cleveland, Ohio

New York Society of Orthodontists

President, Glenn F. Young _ _ _ _ _ _ _ _ _ 745 Fifth Ave., New York, N. Y.
Secretary-Treasurer, William C. Keller _ _ _ _ 40 E. Forty-Ninth St., New York, N. Y.

Pacific Coast Society of Orthodontists

President, Ben L. Reese _ _ _ _ _ _ _ _ _ _ _ Roosevelt Bldg., Los Angeles, Calif.
Secretary-Treasurer, Earl F. Lussier _ _ _ _ _ 450 Sutter St., San Francisco, Calif.

Rocky Mountain Society of Orthodontists

President, A. B. Brusse _ _ _ _ _ _ _ _ _ _ _ 1558 Humboldt St., Denver, Colo.
Secretary-Treasurer, Robert L. Gray _ _ _ _ _ _ _ _ Republic Bldg., Denver, Colo.

Southern Society of Orthodontists

President, Fred G. Hale _ _ _ _ _ _ _ _ _ _ _ Professional Bldg., Raleigh, N. C.
Secretary-Treasurer, T. C. Sparks _ _ _ _ _ _ 1508 Washington St., Columbia, S. C.

Southwestern Society of Orthodontists

President, E. Forris Woodring _ _ _ _ _ _ _ _ _ Medical Arts Bldg., Tulsa, Okla.
Secretary-Treasurer, R. E. Olson _ _ _ _ _ _ Union Nat'l Bank Bldg., Wichita, Kan.

American Board of Orthodontics

President, Charles R. Baker _ _ _ _ _ _ _ _ _ _ 636 Church St., Evanston, Ill.
Vice-President, Frederic T. Murlless, Jr. _ _ _ _ 43 Farmington Ave., Hartford, Conn.
Secretary, Bernard G. DeVries _ _ _ _ _ _ _ Medical Arts Bldg., Minneapolis, Minn.
Treasurer, Oliver W. White _ _ _ _ _ _ _ _ 213 David Whitney Bldg., Detroit, Mich.
William E. Flesher _ _ _ _ 806 Medical Arts Bldg., Oklahoma City, Okla.
James D. McCoy _ _ _ _ _ _ _ 3839 Wilshire Blvd., Los Angeles, Calif.
Joseph D. Eby _ _ _ _ _ _ _ _ _ _ 121 E. 60th St., New York, N. Y.

Harvard Society of Orthodontists

President, Harold J. Nice _ _ _ _ _ _ _ _ _ 475 Commonwealth Ave., Boston, Mass.
Secretary-Treasurer, Edward I. Silver _ _ _ _ _ _ _ 80 Boylston St., Boston, Mass.

Washington-Baltimore Society of Orthodontists

President, Paul W. Hoffman _ _ _ _ _ _ _ _ 1835 Eye St., N. W., Washington, D. C.
Secretary-Treasurer, Stephen C. Hopkins _ _ _ _ _ 1726 Eye St., Washington, D. C.

Foreign Societies†

British Society for the Study of Orthodontics

President, S. A. Riddett
Secretary, R. Cutler
Treasurer, Harold Chapman

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*The Journal will make changes or additions to the above list when notified by the secretary-treasurer of the various societies. In the event societies desire more complete publication of the names of officers, this will be done upon receipt of the names from the secretary-treasurer.

†The Journal will publish the names of the president and secretary-treasurer of foreign orthodontic societies if the information is sent direct to the editor, 8022 Forsythe, St. Louis, Mo., U. S. A.

1905 class of the Angle School of Orthodontia, St. Louis, Mo. *1*, James D. McCoy. *2*, T. M. Hampton. *3*, Harold Chapman. *4*, Weibel. *5*, R. Carter Chambers. *6*, Frederick L. Stanton. *7*, W. W. Scott. *8*, J. A. Burrill. *9*, Homer E. Parshall. *10*, Fred B. Noyes. *11*, E. H. Angle. *12*, E. H. Wuerpel. *13*, W. H. Bolton. *14*, Albert W. Crosby. *15*, George A. DeLong. *16*, A. C. Lockett. *17*, B. Frank Gray. *18*, Josef Grunberg. *19*, William J. Speers. *20*, Fred McKay. *21*, Carin Johnason. *22*, W. E. Sauer. *23*, Martin Dewey. *24*, Asa A. Wallace. *25*, A. F. Monroe. (Courtesy of Dr. B. W. Weinberger, New York, N. Y.)